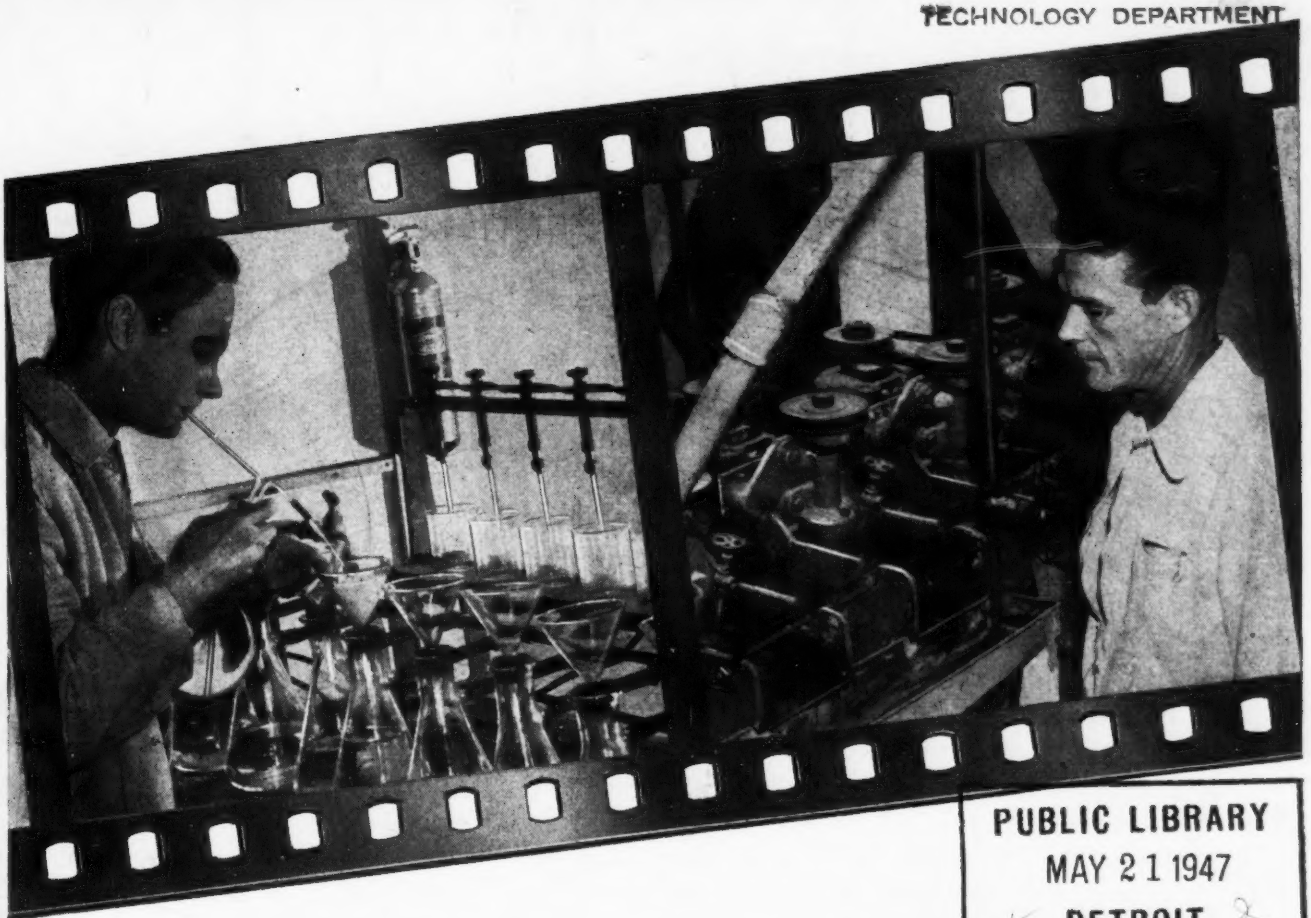
Chemical Industries

May 1947

IN THIS ISSUE

Nylon advances into new fields



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It will pay you to investigate the many industrial applications of this unique oxidizing agent. Write to The Mathieson Alkali Works (Inc.), 60 East 42nd Street, New York 17, N. Y.

Chemical Industries

THE CHEMICAL BUSINESS MAGAZINE

VOLUME 60—NUMBER 5 **MAY, 1947**

DEPARTMENTS

NEWS OF THE MONTH

Cover: Autoclaves in the Du Pont plant at Seaford, Del., in which nylon polymer is created.

PUBLICATION STAFF: Editor, Robert L. Taylor; Managing Editor, W. Alec Jordan; Chemical Editor, Howard C. E. Johnson; Engineering Editor, Herman W. Zabel; Contributing Editors, T. P. Callahan, T. N. Sandifer, Nathan C. Rockwood; Production Manager, O. E. Vaream. **CONSULTING EDITORS:** Robert T. Baldwin, L. W. Bass, Benjamin T. Brooks, J. V. N. Dorr, Charles R. Downs, Ernest W. Reid, Norman A. Shepard. **BUSINESS STAFF:** Advertising Manager, L. Charles Todaro; New York, Wm. B. Hannum, Jr.; Chicago, Frank C. Mahnke, Jr.; Los Angeles, Don Harway; Research & Promotion, Robert H. Baldwin; Circulation Manager, Florence Sanders.

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A MACLEAN-HUNTER publication, Horace T. Hunter, President

THE READER WRITES

More on "Bosses"

EDITORS NOTE: *Requests for reprints of Ernest N. May's article "For Bosses Only" (CI January, 1947) came so thick and fast that the original supply was soon exhausted and it was necessary for us to make up some more. A few of this second batch are still available in case any readers would like extra copies.*

To the Editor of Chemical Industries:

In his article "For Bosses Only," Ernest N. May puts his finger on one of the most important problems in building a successful industrial organization.

Twenty-five years ago the president of a large corporation told me that he had come to realize that his company had been neglecting its most important asset—its supervisory personnel. That company is still one of America's successful giant corporations. I think it is largely because it initiated then and has since maintained a careful study of means of evaluating its younger men and encouraging them to put forth their best efforts.

In contrast, I recall the policy of a large chemical corporation which kept its technical men in separate compartments and insisted on secrecy. I met one of my former students at a convention only ten years ago, and he told me his instructions were to keep his mouth absolutely shut, and not to indicate his company affiliations on registration or in casual conversations. He was to soak up everything he could but was not to give anything in return. That company had no right to expect loyal and enthusiastic employes.

Twenty-five years ago many employers aimed to start their young technical men with a stiff program of routine work to see if they could stand up under it. Some of them boasted that they expected over half of these new men to quit during their first year. The procedure tended to retain the plodders and weed out the men with imagination. I am glad to say that the system has disappeared almost completely.

High income taxes are making it almost impossible for salaried men to accumulate enough property so that they can live on the interest of their accumulation after retirement. Nor can they afford sufficient life insurance to adequately protect their families. When I was a boy a neighbor died leaving his family a modest home and a life insurance policy of ten thousand dollars. The widow could maintain her family comfortably. That ten thousand dollar policy would have been the equivalent of a hundred thousand dollar policy today. There is nothing that employers can do to raise the morale of their employes more rapidly than to provide generously for their families in case of death, and liberal retiring allowances for those who have given many years of service to the company.

Mr. May has championed the cause of the professional men forcefully but fairly. Many employers are already meeting the challenge. They have enthusiastic and loyal men on their professional staffs. It is not a mere coincidence that these same companies are also leaders in new technical developments, and that competitors look with envy at their annual financial statements.

ALFRED H. WHITE
Professor Emeritus of Chemical Engineering
University of Michigan
Ann Arbor, Mich.

To the Editor of Chemical Industries:

Ernest May's article is very interesting reading and contains a lot of sound advice. Many of the "don'ts" therein I have learned the hard way.

My only other comment is that the business of running Development Departments is strictly a 50/50 proposition and perhaps someone might make just as interesting a presentation looking at the other side.

CLARK C. HERITAGE
Cloquet, Minn.

To the Editor of Chemical Industries:

I was much impressed by the thorough understanding Mr. May has of the situation prevailing with reference to employees in the chemical industry at the present time. The only thing with which I am somewhat in disagreement is the tendency to feel that the job is not a good job unless it brings returns of from $38,000 to $100,000 a year.

STERLING L. REDMAN, President
Redman Scientific Co.
San Francisco, Calif.

Sulfuric Acid Correction

In the article, "Sulfuric Acid Concentration—A Summary," appearing in the January 1947 issue, the steam and water line labels are transposed on the flowsheet for the Simonson-Mantius Type E concentrator. Also, the temperature 320°F. appears to indicate the temperature of the condensate leaving the second stage concentrator, whereas it is the temperature of the acid entering the acid cooler. In the second sentence in the first paragraph, page 52, the temperature 300°C. should read 300°F.

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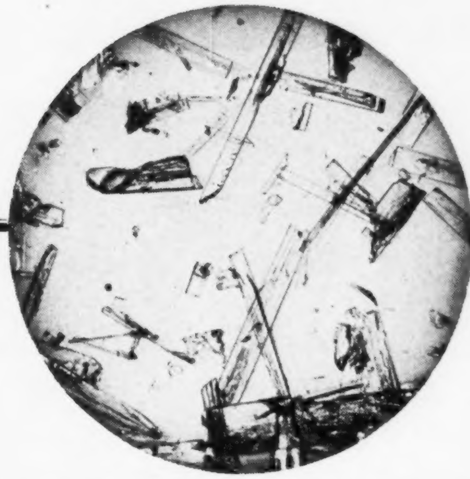

During the years in which penicillin has been produced in quantity, the name of Pfizer has been associated consistently with a high quality source of this antibiotic.

Crystalline Sodium Penicillin G (benzylpenicillin) is shown in the photomicrograph above. This, with crystalline potassium penicillin G, provides a choice of the two types most demanded today — types with which no refrigeration is necessary. These water soluble crystalline salts have received wide acceptance for parenteral administration.

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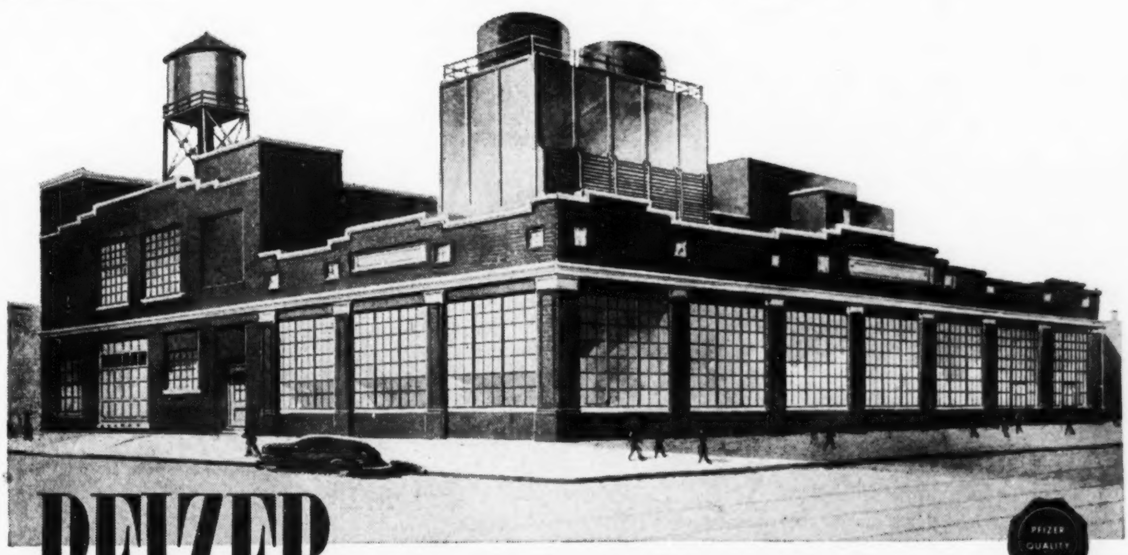

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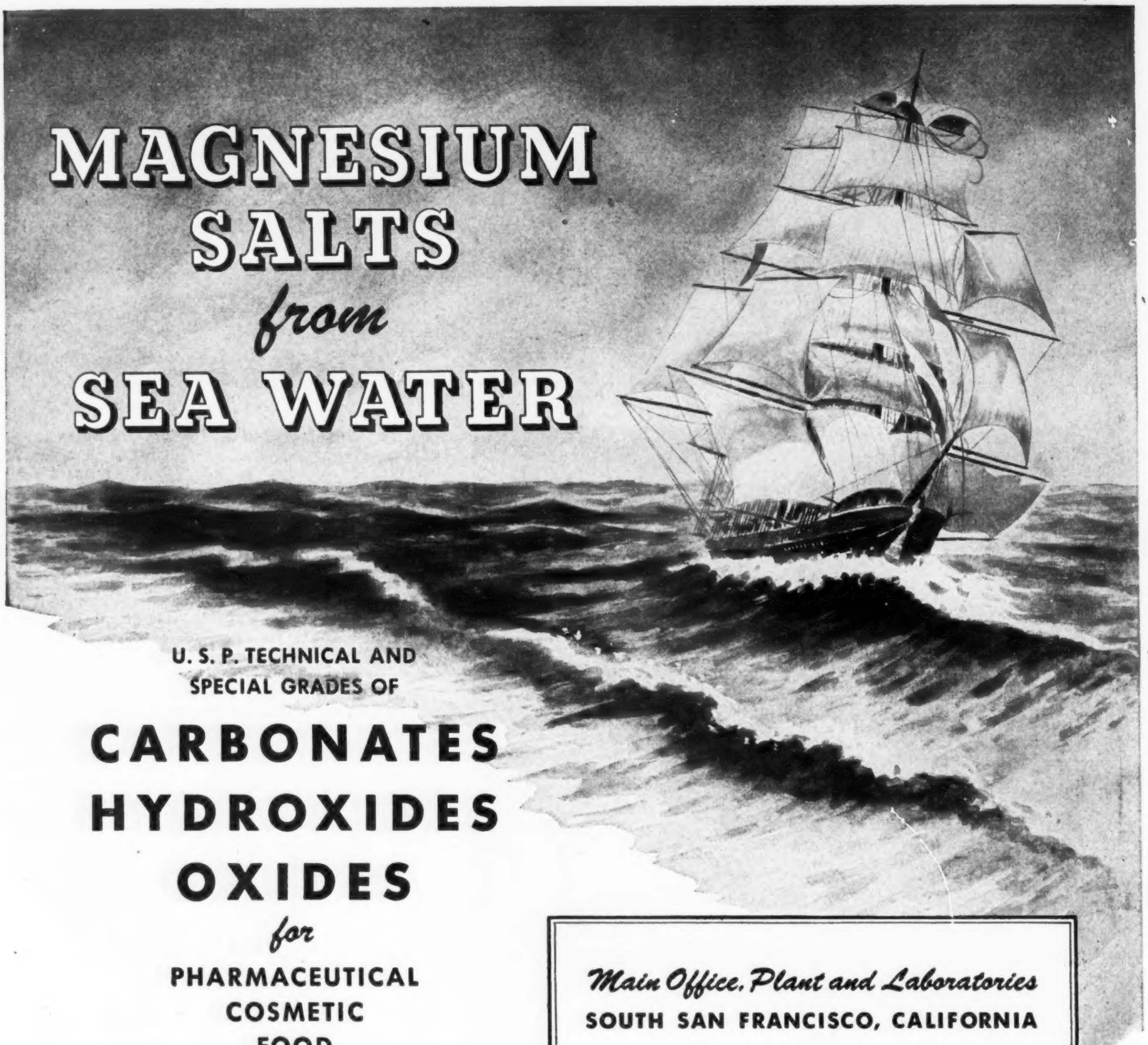

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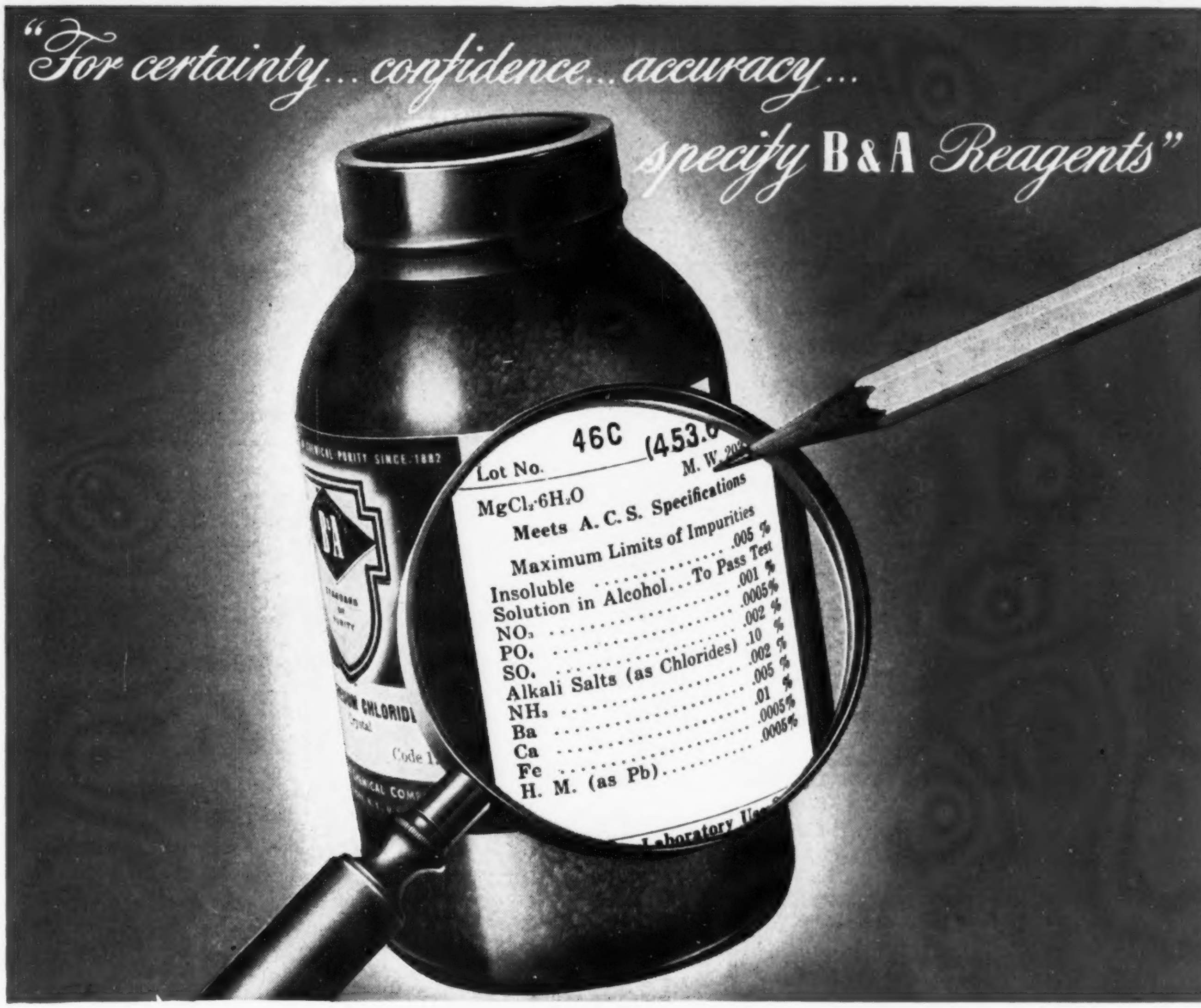
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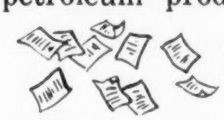
Laboratory Use

CALLS FOR CAUSTIC SODA KEEP US BUZZING

Seems as if *everybody*  wants Caustic Soda these days! The *soap* 

industry continues to order huge quantities of it . . . as more and more uses are developed for this bathroom necessity. Soap plays an important part in the production of synthetic rubber tires.  From glycerin—formed in soap's manufacture—come dynamite  and nitroglycerin, standbys in mining and road-building. Caustic Soda is also making great contributions to the development of the *rayon*  industry. Because of it, fabrics are finer and stronger of texture. Caustic Soda is of benefit in the manufacture of materials used in rugs,  draperies, automobile upholstery and tire cord. It enters—directly or indirectly—into the making of pulp and paper,  petroleum products, many industrial chemicals. All these demands for Caustic Soda  in addition to the increasing requirements from expanding industry—have made it impossible to supply the total demand. Although our production facilities are operating at capacity, we are allocating all our Caustic Soda to our old customers.  Fairness requires us to do what we can to meet their needs first. Meanwhile, we are doing everything possible to increase our production of Wyandotte Caustic Soda. And we anticipate the day when we shall be able to tell every user of this chemical: "Sure, we have *plenty* of Caustic Soda.  How much do you want?"

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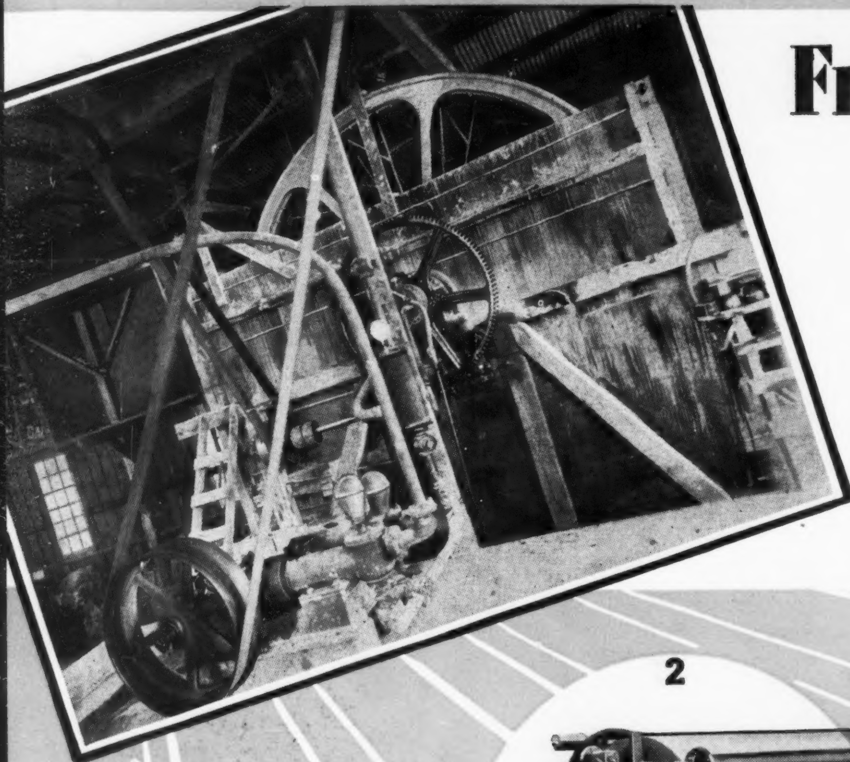

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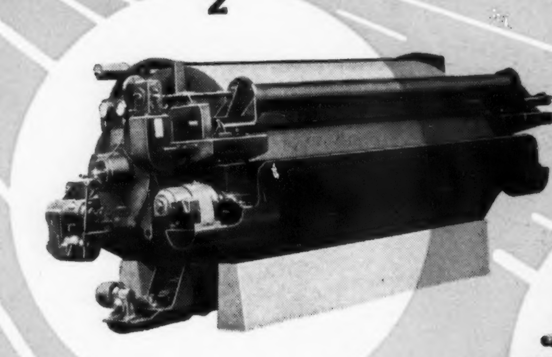

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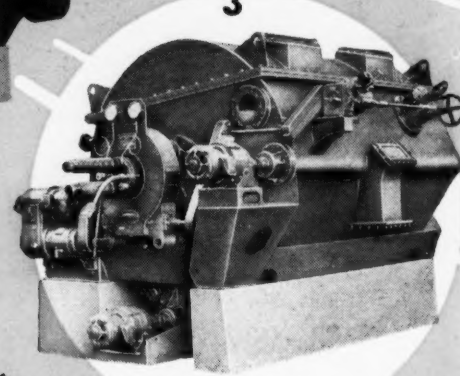

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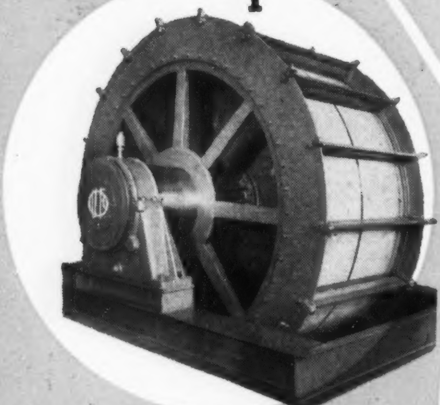

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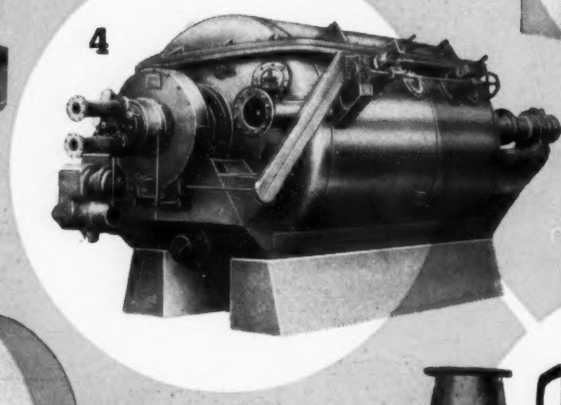

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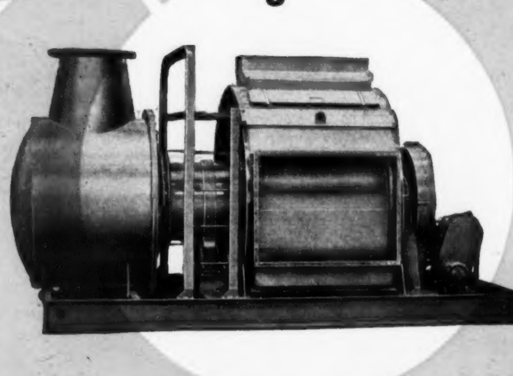

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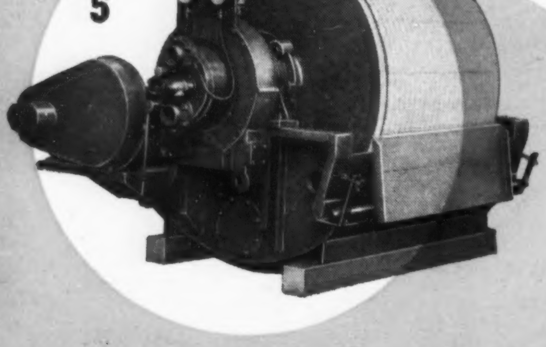

has BENEFITED

Policy of Progressive Development...

That summer saw the first practical application of continuous *automatic* vacuum filtration in this country, the equipment being the first Oliver Continuous Vacuum Filter, designed and installed to wash cyanide residues. The success of this filter marked a turning point in the history of processing because it gradually brought about completely changed filtration and clarification practices throughout industry.

Without deviating from the fundamental principles of that pioneering filter, Oliver United engineers have brought out many variations of the Oliver Filter to take care of the special problems brought to their attention by other divisions of the processing industry. For example, special "Olivers" have been developed for the processing of salt, starch, wood pulp, synthetic rubber, cane sugar, beet sugar, petroleum, phosphate rock and other chemicals. Each Oliver differs from the others in its operating features.

Industry has benefited greatly from this continuing policy of progressive development. It has made possible the economical handling of many intermediate and end products. It has enabled some plants to simplify their processing.

There seems to be no end to the different filtration and clarification problems brought to our attention. Usually, the solution is found in some one of the numerous existing Olivers —or, if necessary, in one of our several pressure filters. But there is no letup in our program of research and development. This is one of the best ways, we believe, to continue to serve industry.

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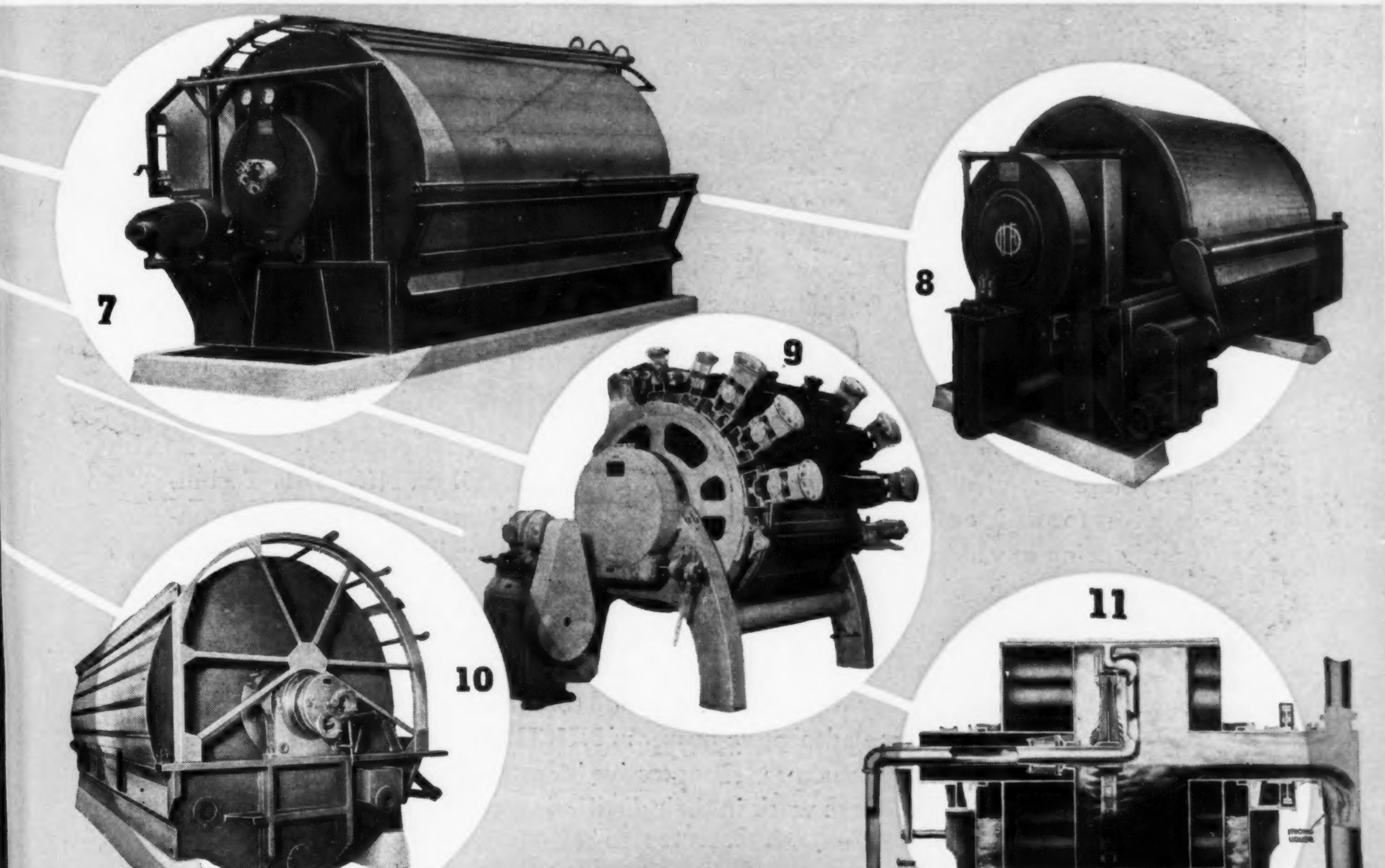

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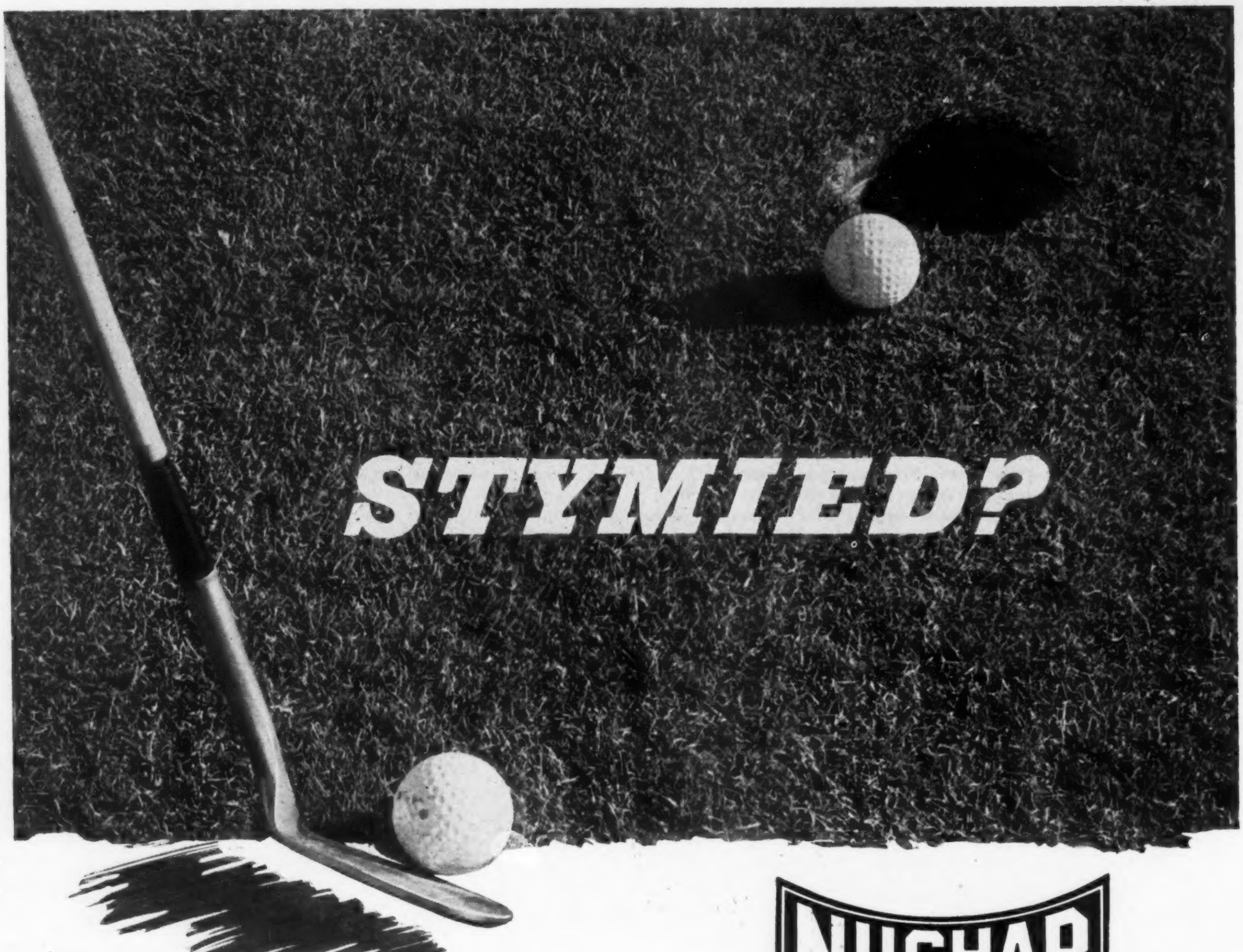

STYMIED?

Chemical Industries

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES • 522 FIFTH AVE., NEW YORK 18, N. Y.

For Your Information: May, 1947

Shell Chemical Co. is about to break big news with acknowledgment of plans to make benzene from petroleum. This month the mooted project moved closer to reality when Shell offered petroleum-derived benzene to several major consumers. Large scale output is on the horizon.

And among the newer chemicals you will soon hear more about from the same source are hexylene glycol, triisobutylene, and diallyl phthalate. Shell will have commercial quantities of the glycol available early next year. One big potential use: steam-setting inks. By this summer triisobutylene will be on the market. A full-scale diallyl phthalate unit came in this month.

* * * * *

Don't overlook developments in cellular plastics highlighted by Du Pont's quiet expansion of its cellular cellulose acetate plant. Among the more promising uses are as a refrigerator insulation -- where CCA possesses advantages over loose-type fills. It is also being used as a strong (yet light) base for suitcases, trunks, etc. Recently an entire airplane wing was made from CCA.

Recent reports of plants to produce pure oxygen at a cost of less than $1.20 per ton portend a revival of interest in the Deacon process for oxidizing HCl to chlorine. Both heavy chemical makers and oxygen producers have long been aware of the possibility of cheap chlorine, given low-cost oxygen. At least two firms were actively experimenting along this line before the war.

* * * * *

There won't be an official announcement on decisions for some months yet but a national association of fur dealers is busy comparing the merits of fire-control chemicals. Little recognized outside the industry is the high value of furs per unit space occupied -- in storage, and in transit. Methyl bromide and liquid carbon dioxide systems are the two being considered most seriously.

With the FDA frowning on the extravagant claims made by one manufacturer of insecticidal aerosols, don't be suprised if makers of air-sterilization bombs (containing glycols, with Freon propellants) cut back on their talk about conquest of the common cold, germ-free rooms, and so forth. Strong hints have already been issued, and if they are not heeded action will follow -- swiftly. Incidentally, a novel carbon dioxide-glycol unit is being readied for national distribution by a leading maker of pharmaceutical products.

It is quite probable that you will hear more about a complex carbamate

which looks promising as a selective herbicide. Uncovered during the screening of 1100 compounds it may be the answer to the problem of controlling narrow-leafed weeds -- particularly many grasses. Two chemical companies are already making small batches for further field testing, and the odds are that it will be on the market next season.

* * * * *

Here's the present picture on the Farrington Daniels (University of Wisconsin) process for the direct oxidation of atmospheric nitrogen, (CI, Feb. '46 - p. 245): The Wisconsin Alumni Research Foundation has made a deal with Food Machinery Corp.to carry on enlarged pilot plant work. This developmental program is proceeding apace, with an eye on commercial applications of the process, but it will be a full year before prospects are clarified. In the meantime Wisconsin is not talking about future licensing policy.

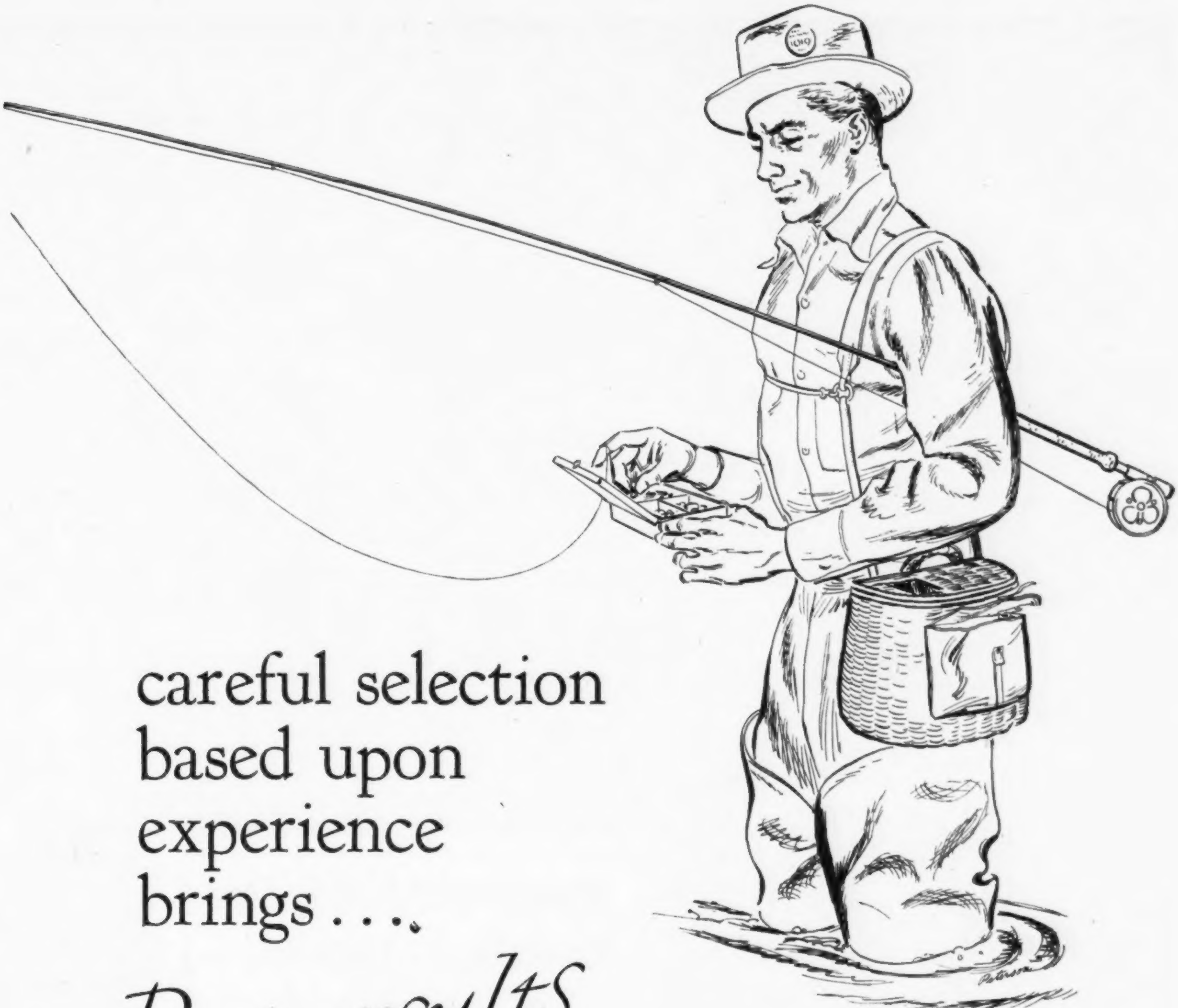
Watch for major developments in petroleum-derived polynuclear aromatics. The widespread utilization of catalytic cracking has upped the percentage of aromatics in refinery fractions, and the wider use of solvent extraction facilitates their recovery. Right now many of these potentially valuable extracts are being burned -- because of the fuel shortage. Oil companies are too busy on a host of other projects to do much about them for the nonce. But the possibilities haven't been overlooked. Action can be expected within a year or so.

* * * * *

Here and There:

Scheduled for early promotion is a new compound Victor Chemical Co. is now pilot-planting which will render methyl methacrylate resins fireproof.... Mc Carthy Chemical Co., Winnie, Texas, has let a contract for construction of a sizable oxygen plant. Cost will probably exceed $1 million. .... A recent patent issued to Socony-Vacuum Oil Co. covers the conversion of methane to benzene. Tin tetrachloride is the reaction promoter and significantly the process operates below 1000°C. .... It is hardly a trend, as yet, but another silver cleaner of the Dippo type (alkali packaged in aluminum foil envelopes) will soon be introduced by a major specialty house. Dippo, put on the market by Interchemical Corp. last year, employs the long-known electrolytic principle -- used in the old home method -- "boil your silverware in washing soda in an aluminum kettle." The new item will be priced well below the Dippo level.... Don't overlook the clever advertising Monsanto Chemical Co. is placing in connection with its textile specialty, Resloom. The copy is aimed at getting the public to demand Resloomed apparel, as well as to induce clothing makers to tag their products as Resloom-treated. All of which can spur sales to textile processors. .... It is now reported that the much-discussed Du Pont proposal for a hydrocarbon cracking plant at Deepwater, N. J. (Orchem Dept.) has been abandoned. .... Fused nitrate salt baths, long used for metal heat-treating, have recently entered new fields; cleaning tire molds of adhered rubber, and renovating plugged textile spinnerets. .... Copper naphthenate, widely used as a fungicide for shoe linings, is experiencing some competition from the mercurials. One top-volume shoemaker has just begun mercurial treatment for its products, and may feature anti-fungicide properties in company advertising. .... Carbide and Carbon Chemicals Corp. is planning to introduce a new -- hard -- Carbowax soon.

The Editors



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ROAD SIGNS

by *ROBERT L. TAYLOR, Editor*

A GOOD AUTOMOBILE DRIVER keeps his eyes far ahead on the road. He doesn't worry about the ripples in the next twenty feet of pavement. They are behind him before he has a chance to do anything about them, and if his car is in good condition they seldom mean more than a passing jolt anyway. By watching well ahead for the hills and curves he is sure of staying on the road without slowing his speed.

Those in the drivers' seats of chemical industry might well review this early chapter in their lesson books, for traffic on the chemical highways moves at a fast pace, and there are evidences of plenty of concealed twists and turns and side traffic in the stretch ahead.

We have recounted often on these pages the need for vision and long range planning in the successful running of a chemical company. We almost hesitate to bring the subject up again. But it never diminishes in importance, and it isn't often we can call attention to a new aid to such planning that embodies the thorough investigation and groundwork that has gone into the monumental study recently completed by economists of the Twentieth Century Fund.

The national economic picture for the next twelve years is the subject of this study. Its conclusions are based largely on projections of carefully researched trends. It admits that such trends may be seriously deflected by war, depression or strikes, but on the basis of past performance and known facts it believes the patterns will persist and will determine the basic course of business and industry over the coming years.

Most of the trends have to do with the fundamental human needs. These needs, it is reasoned, will be the biggest factor in determining what people will buy and, therefore, what—and how much—industry must make.

The study points out, and attempts to measure, potential needs over the period for such things as food, clothing, housing, medical supplies, transportation and other goods, as well as non-material needs such as education, recreation and opportunities for culture.

Filling all projected needs for 1950, the study concludes, will require a gross national product (at 1944 prices) of $200 billion. In 1944, at the peak of the war stimulation, the total product was $199 billion. At 1944 prices, it was only $107 billion in 1929, $128 billion in 1940 and $150 billion in 1941.

For 1960, the projected need is for a gross national product of $219 billion.

This study can be of special value to chemical companies.

One of the desirable things about the fast pace of chemical development is that, like the speed of a fast-flying airplane, it permits a high degree of maneuverability. Compared with most other large scale manufacturing industries, chemical making is a very flexible business. It is possible for most chemical companies to chart their courses with a good deal of freedom and at the same time be in a position to change direction quickly if necessary.

The Twentieth Century Fund study provides some sound guideposts for laying out a company course through the 1950-1960 decade. It can offer some practical assistance in assuring that the course will pass through profitable territory. A simple consideration of the real needs of people, such as provided in the study, quickly shows that chemical industry is still far from saturating the potential market for its products, that some of the undeveloped areas may even now be riper than we think.

Prudence may be in order as far as plans for the next year or two are concerned. But there are more than a few signs that a new and still greater chemical era is in the making. By setting their sights five or ten years ahead, chemical company managers will be better prepared to carry out their industry obligations and to guide their respective companies along the main highway of progress and profits.

News While It's News

THIS MONTH SEES THE INAUGURATION of another new feature that will further round out CHEMICAL INDUSTRIES' service to its readers.

Last month we introduced you to *What's New*, the up-front news section that will bring you regularly the latest information about important major developments in the chemical process industries, along with an interpretation of their meaning and significance.

Now, in this issue on pages 755 and 756, we bring you the *CI Newsletter*. Each month Newsletter will appear on a special green page just ahead of the editorials so you will be able to find it quickly if you are in a hurry. In Newsletter the editors bring you a highly distilled two pages of important news notes about products, processes, companies and people that are so fresh that the additional details required for a more complete story are in most cases still not available. Newsletter will not deal in rumors or gossip. All of the information contained in it may be considered authentic, just as in any other section of the magazine. Most of its content, in fact, will have been secured by the editors direct from the original sources.

We hope readers find this new feature a practical aid in their jobs and in keeping up with the fast-moving chemical world. That is what it has been designed to do. Won't you let us know what you think of it?

Incidentally, the response to the first appearance of *What's New* was so favorable that you will note we have increased the section to nine pages in this issue.

Petroleum Aromatics

MANY CHEMICAL PEOPLE professed to believe that the wartime production of an aromatic material—toluene—from petroleum was only a "war-baby". However, petroleum-based toluene is still being marketed by Shell from the production at its Wood River refinery.

When the production of phthalic anhydride from petroleum-based o-xylene was announced by Standard Oil of California, others said no further plants of this type would be built. But, carlot quantities of o-xylene have been shipped from California to a large producer of phthalic anhydride in the Atlantic Coast area. O-xylene has also been offered by Shell.

The phrase, "coal, air and water", which du Pont has used to describe the source materials of nylon, may well have to be changed to "petroleum, air and water". The major nylon starting point, cyclohexane, is now being offered by Shell, and in fact petroleum cyclohexane has already been used on occasion by du Pont at its Sabine River Works.

Cresylic acids from Shell and Oronite, polyalkyl naphthalenes and m- and p-xylenes from Oronite are also included in the rapidly growing list of petroleum-based aromatics now being offered commercially.

And finally it has been announced this year that the simplest of all the aromatic hydrocarbons, benzene, will be made from petroleum. The newly-formed McCarthy Chemical Co. of Texas has stated that petroleum benzene will be one of its major products, and only this month we learn that Shell will soon offer this product to the trade.

It is realized that this emergence of petroleum-based aromatics has been abetted by the great shortage that exists for practically all aromatic compounds, but it is questionable if the petroleum companies would start marketing these materials with such vim and vigor if they only intended to skim the cream off the present seller's market. In any event, whether the petroleum based aromatics will serve mainly to supplement the short supply of aromatic compounds that threatens to become chronic, or emerge as a major factor in the market, insurance has been set up against the wide variations in availability that are characteristic of products of the volatile steel industry and the unpredictable Mr. Lewis. Further, petroleum promises to provide large quantities of aromatics such as m- and p-xylene, which are available only to a minor extent from coal.

No More Texas City's!

CAUSES OF THE TEXAS CITY DISASTER are still not clearly known, and perhaps they never will be. It is clear, however, that the freighter *Grandcamp* caught fire at the dock while it was taking on cargo. The fact that the catastrophe occurred at that particular juncture is significant.

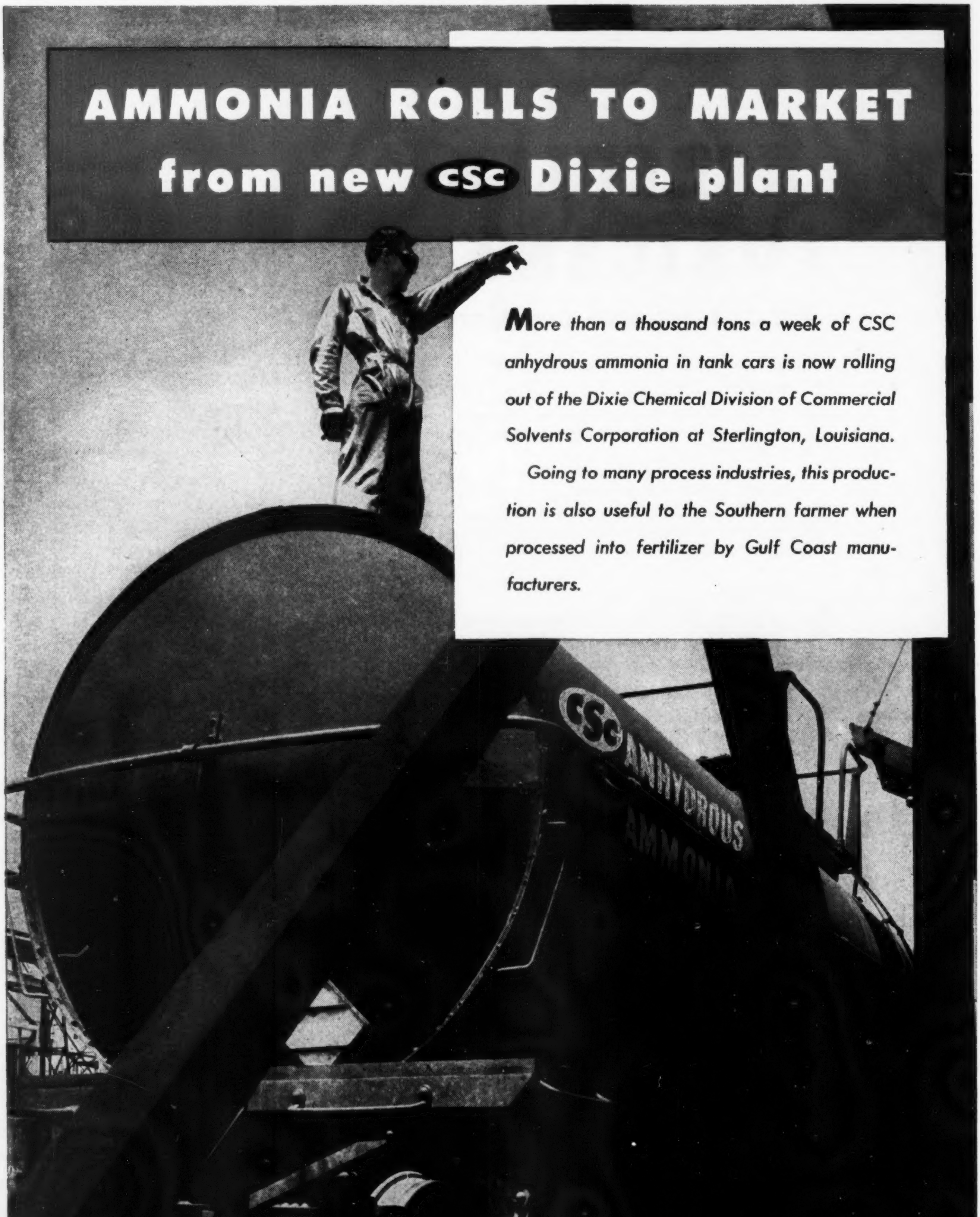
The Interstate Commerce Commission has jurisdiction over rail shipments as far as the docks; and the Coast Guard has authority over cargoes in ship bottoms. But who watches over loading and unloading operations? No one, except local port authorities.

No criticism of the Texas City officials is implied, for they adhered to regulations which were thought adequate. It is interesting, however, that the Port of New York does not allow lading of ammonium nitrate at city piers. Examination of rules governing other ports would undoubtedly reveal a wide divergence in the handling of this as well as of other dangerous materials.

What is needed, it seems to us, is an extension of jurisdiction, either of the ICC or the Coast Guard, to cover handling operations at dockside as well as actual transportation. The facilities of either of these agencies are more extensive than those of local authorities, and it is reasonable to presume that the regulations they promulgate are founded on the best possible data and experience. By extending their jurisdiction, safety practices can be standardized.

The Greatest Loss

The greatest loss at Texas City was not a 10-million dollar chemical plant or months of production of a valuable product. It was the human beings swept off the dock, trapped in the blazing inferno of the buildings, crushed or seared as they walked in the vicinity. Of the 19 area supervisors on duty in the Monsanto plant at the time, 14 were lost. These experienced technical men will be hard to replace. They will be harder to replace as fathers, sons, and husbands.



COMMERCIAL SOLVENTS CORPORATION ★ DIXIE CHEMICAL DIVISION ★ 17 EAST 42ND STREET, NEW YORK 17, NEW YORK

Chemical Industries

MAY, 1947

What's new

SECOND WIND FOR PHTHALIC

Phthalic anhydride has traditionally been made from naphthalene, but this month's offerings of o-xylene by two major companies marks an important step, raises some questions.

IT'S NO SECRET to the makers of alkyd resins, plasticizers and vat dyes that phthalic anhydride is scarce. The shortage prevailed throughout the war despite considerable increases in production. Thus far the shift from war to peace has done nothing to help the situation—if anything it is worse.

New hopes for relief were engendered when the Oronite Chemical Co. (subsidiary of Std. Oil Co. of Cal.) started producing phthalic from o-xylene late in 1945. However, this single producer with only about five percent of the nation's capacity hasn't been able to make much of a dent in the overall shortage.

But the hopes of o-xylene may soon be realized. In the past few weeks two major oil companies have offered tank-car deliveries; one has actually made shipments.

Naphthalene Falters

Up to now phthalic anhydride has been tied to naphthalene—and naphthalene has been tied to coal tar and steel. Last year phthalic production was only about two-thirds of the potential capacity (173 million pounds) because of a lack of sufficient raw material. Peak production of naphthalene during the war was just a little over 300 million pounds. At the same time coal tar reached a top production of 780 million gallons—a quantity which should contain around 600 million pounds of naphthalene. But it is impossible or uneconomical to recover all of the naphthalene content of coal tar. Even the exigencies of war failed to substitute other fuels for the 20 to 30% of the available coal tar burned in open-hearth furnaces.

Price and demand govern the distillation of coal tar. The great number of its components and the diversity of their uses complicate the situation. It's like a ball of twine—you can't get a piece out of the middle without unwrapping the outside layers. The unwrapping process costs money and the whole string must be disposed of. Thus the supply and price of naphthalene are inextricably bound to markets for creosote oil, pitch, etc.

It is unlikely that the annual production of naphthalene will greatly exceed 300 million pounds in the next few years. An outside top figure would be 400 million pounds.

Xylene is Ready

Meanwhile the demands for naphthalene pile up. The biggest is for phthalic anhydride—about two-thirds of the total—but important also are insecticides, detergents, plant hormones, rubber chemicals and dyes.

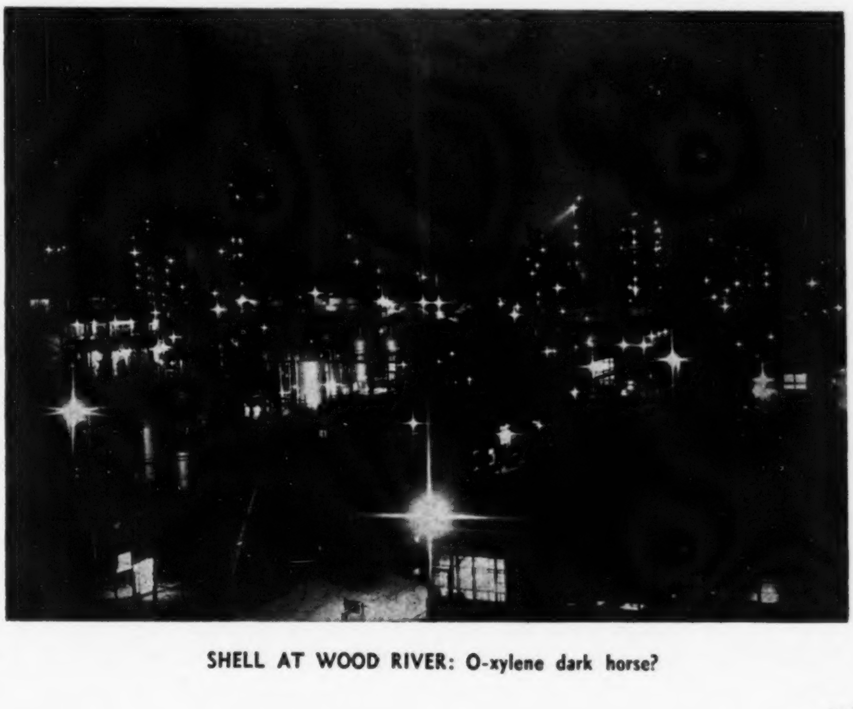
The idea of making phthalic from o-xylene is not new. It was tested in the laboratory during the last war, but nothing came of it then because there was no commercial source of this material at the time.

What finally brought xylene into the picture was the war-time development of toluene from petroleum. Here a process called "hydroforming" converts aliphatic and alicyclic hydrocarbons into aromatics. The post-war twist to make xylene instead of toluene is basically one of changing the feed stock from a C_7 to a C_8 cut.

While the refiner can make xylenes more or less at will, he is not entirely free from the ball of twine difficulty either. The crude product he gets contains only 15 to 30% of the ortho isomer. The overall economy of the operation depends upon the markets for the other constituents, chiefly meta and para-xylenes. These currently find their major use as solvents. At the moment solvent grades are bringing 22 to 23¢ per gallon; the ortho isomer (over 90% purity) may fetch around 30¢ per gallon.

The Handicaps Given

Because of the tie-in markets oilmen cautiously state that o-xylene is not a replacement for naphthalene in the production of phthalic; it's just a supplement. But the price they have quoted is almost competitive with naphthalene. Industry



SHELL AT WOOD RIVER: O-xylene dark horse?

scuttlebut: o-xylene, 4 to 5¼¢ per pound, F.O.B. shipping point vs. naphthalene at 4¼¢ per pound, freight equalized.

Technologically o-xylene isn't yet quite competitive with naphthalene. Although the yield is theoretically 20% higher (weight basis), reports to date indicate that they still haven't equalled yields from naphthalene. Then too, the use of xylene entails somewhat different operating conditions, chiefly higher temperatures.

Off to the Races

Just how much phthalic anhydride our economy can absorb is problematical. Conservative estimates run around 200 to 250% of last year's production. Alkyd resins are currently in great demand as protective coatings on a host of consumer durables made of metal: autos, refrigerators, etc. The booming vinyls will call for unprecedented amounts of phthalate plasticizers in the next year or two.

Unlimited amounts of phthalic cannot alone break the present log jam. The alkyds also need glycerin and drying oils —both scarce. And the plasticizers require equally short alcohols: methyl, ethyl, butyl, octyl, etc. But in all these other materials there is real hope of boosting production. With naphthalene tied to steel o-xylene is the best immediate hope for phthalic anhydride. A little later there may again be substantial imports of naphthalene from Germany, but probably not before late next summer.

Not to be overlooked is the possibility that oil companies may someday make phthalic anhydride themselves—following the lead of Oronite. Many refiners are already knee-deep in the chemical business; several major coal tar processors have found it profitable to market phthalic instead of naphthalene. If the price competition between o-xylene and domestic or imported naphthalene ever gets too stiff, more oil refiners may find the stable price or phthalic a better haven.

SODIUM SCAVENGER

Ten years of service tests have proved superiority of power cable sheaths fabricated from sodium-purified lead. Previous to that time over a third of the sheaths failed in service, and three-quarters of the failures were attributed to initially defective sheaths.

Lead is the best material for cable sheaths, but even so it was thought for a time that some other material would have to be used; lead occludes oxides, sulfides and various other gases which eventually cause corrosion at the crystal interfaces.

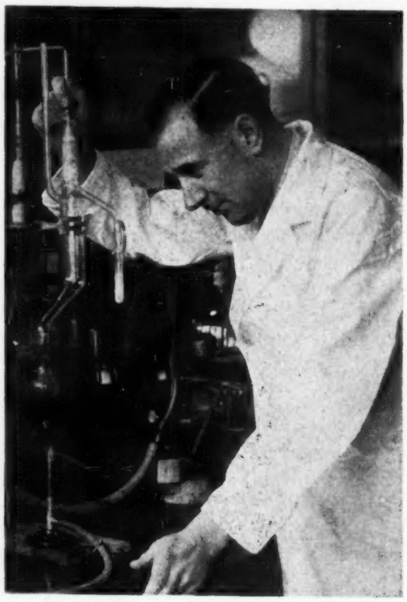
It was discovered that addition of a sodium-lead alloy to the molten lead solved the problem. The liberated sodium reacts vigorously with the impurities, and the compounds so formed rise to the surface of the heavier lead and are skimmed off.

BETTER THAN NYLON?

A novel textile fiber appears on the scene and sparks interest in a versatile, but heretofore neglected acid.

ALMOST three hundred years ago Robert Hooke suggested that silk-like filaments might be obtained by squirting suitable resins through a fine jet. But until the turn of the century the many and varied textile requirements of the world had to be met, perforce, by the utilization of naturally occurring fibers. We lacked Hooke's vision.

However in the past few years much progress has been made. Rayons, Vinyon, Aralac, and nylon have all become materials of substantial commercial stature.



J. T. DICKSON: From Hooke to heavy springs.

And this month, with the opening of the British Industries Fair, the spotlight turned on a new contender for textile honors—Terylene. In some respects this new filiament (made by condensing ethylene glycol with terephthalic acid) is superior to both nylon and the rayons; in others it falls short.

How It Was Discovered

In a sense the discovery of Terylene harks back to Carother's nylon research. He pioneered. He investigated the results of combining different acids and diamines. His work pointed up the potential worth of many superpolyamides.

It was logical, therefore, to consider the production of superpolyesters. Many were studied—particularly the reaction products of selected straight-chain acids and alcohols. Most were potential fiber-formers, but they had serious deficiencies: they melted at too low a temperature and were too easily attacked by alkalies.

Nevertheless, in 1941, J. R. Whitfield, directing research for the British Calico Printers Association, decided to carry the research further; set about preparing superpolyesters from aromatic (rather than aliphatic) acids and alcohols. He assigned his 23-year old assistant, Dr. J. T. Dickson to the investigation. Within six months it was established that terephthalic acid (para phthalic acid) condensed with ethylene glycol yielded an interesting product—a high-melting superpolyester which could be spun and drawn into a strong fiber. Unlike earlier materials, it was resistant to hydrolitic attack.

Thereafter, in conjunction with Imperial Chemical Industries Ltd., manufacturing processes were developed—for the preparation of high-purity glycol and terephthalic acid, and the evolution of optimum condensation conditions. Subsequently extrusion problems were studied, for, as is the case with nylon, filaments of Terylene are initially weak and extensible—must be "drawn" to strength.

Novel Properties

The stress-strain relationships of Terylene differ quite appreciably from those of nylon and the rayons. Specifically, Terylene possesses a high initial modulus of elasticity—that is a relatively high load must be applied to produce a small extension. Its length recovery is very high, and takes place rapidly. In essence it behaves much like a heavy spring.

As a fabric it has a warm feel and high wet-strength—thus can withstand laundering well. Likewise it is resistant to dry cleaning solvents, dilute mineral acids, and bleaching agents. It is attacked by alkalies, but not to a serious extent. Terylene is also resistant to mold and bacteria, stable to light, and has a low water absorption.

Of primary importance is the fact that it can be heated to about 200 C. without being discolored or degraded. And it can be "set" by heat treatment to make it dimensionally stable to subsequent heating. Hence it is possible to knit hosiery, or weave fabrics from "unset" Terylene, subject them to "heat setting" and attain permanent shaping.

But there is one major problem to be conquered. Moisture absorption of Terylene is low, and there is practically no swelling of the fiber when it is immersed in water. So the dyeing of the new fiber presents many difficulties.

Where It Will Be Used

The basic properties of Terylene point directly to its field of promise. It can be produced either in the form of a monofilament or a multi-filament yarn. Or it can be made as a staple fiber.

The new synthetic may well carve out a niche for itself as a versatile fabric. Its chemical inertness permits its use as a window-screening material, and as a filtering cloth base. Low moisture absorp-

tion is an ideal requisite for tenting materials; resistance to fungi is another asset. The importance of its heat-setting characteristics cannot be discounted.

It will be a matter of two years before quanities of Terylene are available. But the odds are that it will become an important textile filament, and correspondingly will require heavy tonnages of both glycol and terephthalic acid.

This latter probability has research and development men scurrying about trying to guess what process, and which raw material will come out on top.

At the moment para-toluidine, cymene, para-xylene, and cyclooctatetraene (CI Apr. 47, p. 591) are the basic materials being most discussed. And the future will bring still more entries.

DIGGING DEEPER

While petroleum refiners have been busy getting into the chemical business, oilmen haven't forgotten that they are in the fuel business. In recent weeks the press has been replete with notices of diverse activities: making gasoline from natural gas, developing foreign oil fields, converting coal into liquid fuels.

But the volatile and opportunistic press hasn't done so well at resolving the common denominator to these mixed fractions. It's basically a matter of long-term oil reserves and a more pressing problem of rising crude oil costs.

Future Oil Reserves

Top-flight geologists say that the nation's proven oil reserves will be as great 20 years hence as they are now. Over a much longer period no one can be sure, but it looks as though we will be using it up faster than we can find more.

Right now there is the problem of the sharply rising costs of discovering and producing crude oil. Says Robert E. Wilson, board chairman of Standard of Indiana, "The cost of finding new reserves is around six times what it was ten years ago, and is still on the upward trend."

More than mere facets of the current inationary swing of all labor and material prices, these crude oil cost increases are rooted in geology. Wells are going deeper —the maximum producing depth, under 10,000 feet in 1930, is now nearly 17,000 feet. As wells go deeper the tendency seems to be that more of them strike gas. In spite of present highly refined instruments and methods to aid prospecting, the percentage of wildcat failures is as high today as it was years ago.

The Odds on Synthesis

It all adds up to more expensive domestic crude oil. Thus certain rich foreign fields look promising. And, synthesis processes utilizing natural gas or coal look better both as additions to the reserve and in comparison to the projected costs of producing oil in the future.

RATS AND MITES

Industry-financed university research yields a novel chemical holding promise as both an insecticide and rodenticide.

EVER SINCE the discovery of super-insecticides agriculturists have been faced with a serious problem. DDT, for instance, kills many insects, leaves others untouched. Significantly, many of the bugs which DDT dooms are those which hold other insects in check. They are the predators. As soon as they are eliminated aphids, mites, and kindred pests flourish. Extensive, difficultly-controllable infestations flare up.

So entomologists have eagerly sought chemicals which would eradicate many of

GEORGE LUDVIK: Among men who know nicotine best it's TEP 10 to 1.

the pests which DDT does not kill. And one they have used most successfully in the past year is hexaethyl tetraphosphate. Several companies began to make this phosphate last season; considerable quantities are now being shipped. But this month a few details of a more potent insecticidal phosphate filtered out. Its name: tetraethyl pyrophosphate.

One Step to Another

Actually the discovery of the insecticidal properties of tetraethyl pyrophosphate (or TEP, as it will probably be called) is linked to work conducted on its near-relative hexaethyl tetraphosphate (HET). When OTS investigators learned that the Germans were using HET as a replacement for scarce nicotine compounds, several U. S. concerns scheduled field tests, and shortly thereafter began commercial production. The development was interesting in itself, but it also suggested other possibilities. What about other alkyl phosphates? Research programs were initiated and from these—notably those sponsored by Monsanto and Victor—came TEP.

Two men pioneered the phosphate research. One, Dr. A. Mangun, University of Chicago, pushed toxicological investigations. The other, George Ludvik, University of Illinois, probed its insecticidal properties.

Rats, Aphids, and Mites

As yet but little information is available on TEP as a rat control agent. Observations are preliminary, but portentous.

The new phosphate rates high as an insecticide however — and preliminary tests place it as ten times as effective as nicotine, three times as potent as HET. One feature it possesses is that it leaves no poisonous residue, for it decomposes within a few days after application. Thus food products, on which it will be most widely used, need not be washed before marketing. However such rapid decomposition obviously places a limit on TEP's useful life.

TEP may well curb the depredations of numerous insects, how many species cannot be definitely stated as yet. But the major field of promise will be in aphid and mite control—on such crops as apples, potatoes, peaches, and cabbages. Possibly it may be of value in combatting the destructive codling moth, and a lengthy list of other havoc-wreaking food destroyers.

A Year Away

Nevertheless the full utility of TEP in agricultural fields will not be established for at least a year or more. Then it may be marketed as a supplement to DDT. Conceivably it can be used as a spray, or dust component, or as an aerosol ingredient.

The odds are against its being patentable from a product standpoint because, as a chemical, it has been long-known. But there will be process patents covering its manufacture. At least one company has already filed such an application.

RUBBER RADICALS

Photochemical—reactions may eventually be employed to convert petroleum hydrocarbons into rubber-like or plastic polymers. Zinc, cadmium and mercury vapors absorb light readily, and these light-activated atoms can transfer the absorbed energy to hydrocarbon molecules.

Then any of a number of things may happen: The molecules may break up into hydrogen atoms and free alkyl radicals, or molecular hydrogen may be eliminated, leaving olefins. The free radicals can combine in a chain reaction to form polymers, and olefins can be polymerized in conventional ways.

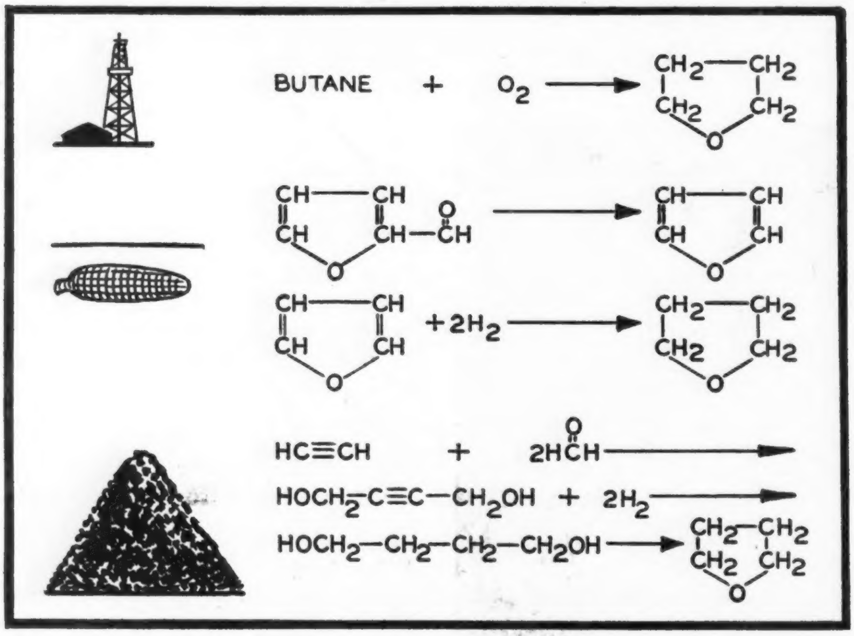
TETRAHYDROFURAN

Agricultural wastes, petroleum and coal are all possible raw materials for this new solvent and intermediate.

TERAHYDROFURAN, long a favorite of the Germans, for whom it furnished 20 per cent of their butadiene for synthetic rubber, is now playing before an America 1 audience. It is being presented both by Celanese and DuPont, and it may not be long before at least one other is in the field.

This cyclic oxide is interesting both for its own sake and for its versatility as an intermediate. On the first score, it is reported to be a superior solvent for natural and synthetic rubbers, the intractable polyvinyl chloride, and other vinyl polymers and copolymers. It will carry high concentrations of resins, it is claimed, without becoming viscous. Patents have been granted, too, for its use in solvent refining or lubricating oils.

As an intermediate, it polymerizes (forming polytetramethylene oxides) to soft resins or solid, rubbery masses. Ammonia and amines react with it to give pyrollidines, and hydrogen sulfide combines with it to yield dihydrothiophene.



All This and Nylon Too

By far the most eventful use of tetrahydrofuran developed to date in this country was described in last month's issue of CI. Du Pont is building a $3,000,000 plant at Niagara Falls, N. Y., to manufacture adiponitrile, a nylon intermediate, from tetrahydrofuran. (By reaction with HCl to give 1,4-dichlorobutane and treatment of that with sodium cyanide.)

Another nylon intermediate, adipic acid, results from the reaction of tetrahydrofuran with steam and carbon monoxide in the presence of nickel carbonyl (CI, Oct., 1945, 643), but the reaction hasn't been exploited commercially in this country.

Du Pont's tetrahydrofuran is obtained by hydrogenation of furan, which in turn results from heating furfural to a temperature of about 400°C. in the presence of a catalyst to remove the aldehyde sidechain. The furfural comes from Quaker Oats Co. plants at Cedar Rapids, Ia., and Memphis, Tenn., where it is produced from such pentosan-containing agricultural by-products as corn cobs, oat hulls, and cottonseed hulls.

Experimental quantities are being offered now, but commercial amounts won't be available for another year.

Down at Bishop, Texas, Celanese oxidizes a mixture of C_3-C_4 hydrocarbons to a whole gamut of organic compounds, and last month Celanese announced the availability of tetrahydrofuran. Whether it is recovered directly from the reaction product issuing from the oxidizers or is produced in a subsequent step is not known. Semi-experimental amounts are offered at the present time, and commercial quantities will be ready, it is hoped, by the end of the summer. It is understood that tentative prices of 40¢ per lb. or thereabout have been mentioned in the trade, but the ultimate price will depend on the final production rate which is achieved.

From Acetylene?

A dark horse in the derby is the Reppe process (CI, Sept., 1945, 456) from the stable of General Aniline & Film. Acetylene reacts with two mols of formaldehyde in the presence of a metal acetylide catalyst to give 1,4-butynediol. Hydrogenation gives tetramethylene glycol, which dehydrates to tetrahydrofuran. General Aniline advertised research samples of butynediol some months ago and is believed to be working on other products from this series of reactions.

Handle With Care

Because of the great research interest in tetrahydrofuran, it is in order to report findings on its toxicity. The Germans found that a single inhalation of air containing 3000 ppm of the compound was enough to produce a distinct narcotic effect. Irritation of the skin and mucous membranes, and serious damage to the liver and kidneys have been noted after long exposure to high concentrations. As with all aliphatic ethers, particular care must be taken to prevent the formation of explosive peroxides upon exposure of the material to the air.

Whatever future demands for tetrahydrofuran be—and it appears that they will be not inconsiderable—the supply potential rests on a trivet-solid foundation: At one corner is Du Pont with agricultural by-products; at another is Celanese with petroleum; at the last, probably, will be General Aniline with coal products. Thus in the production of a single chemical is epitomized the never-ending struggle among the basic sources of carbon compounds.

TAILOR-MADE WAXES

A newcomer to the synthetic wax field lays plans for greater production and goes after world markets.

BEFORE the war I. G. Farben enjoyed a lush export business in synthetic waxes. The I. G. products, derived from montan, were shipped to nearly every country in the world. Their major use: as a replacement—or extender for—carnauba.

In recent years, since the I. G. waxes became unavailable, and as carnauba and other vegetable wax prices soared, there have been dozens of synthetic products placed on the market. Many have been quite good, but by and large most wax synthesizers have confined their selling campaigns to domestic markets. Few have sought or entertained the thought of world-wide distribution.

New Plant, Early Output

But this month a British waxmaker—Abril Corporation—laid ambitious plans, prepared to put in its bid for world-wide business. Board chairman Jacob Liss flew to the U. S., appraised raw material and market possibilities, drafted plans for a $200,000 plant to be built in New Jersey, hoped for 10,000 tons per year output by October.

The reasoning behind the move was simple. Abril Corp. was formed in Great Britain some 18 months ago. Its chief asset: the research work conducted during the previous six years by the three Liss brothers. The British government,

striving for industrial self-sufficiency, financed the project, provided the company with a former Ordnance plant. Output is now running at a 5,000 ton per year level, but raw material shortages have curbed expansion plans.

Exports (amounting to 2,000 tons last year) could be made to only a few countries. Obviously, production in the U. S. would mean a better source of raw materials, would permit bidding for a share of the U. S. wax business, would enable Abril to lay plans for selling in Canada and South America. And that is just what the company hopes to do.

Properties and Promise

Just as significant are the products themselves. They are esters of higher fatty acids, derived in the main from such raw materials as whale, palm and castor oils. There are 32 different waxes being produced as standard items in England. Each has individual, closely-defined, characteristics — melting point, acid value, color, and so forth. The lowest melting point: 43°C, the highest: 285°C. Probable price range: 50 to 80 cents a pound. They are soluble in petroleum solvents, compatible with all paraffin and vegetable waxes, insoluble in water, and emulsifiable.

When plans are completed Abril will cultivate polish-makers—seek a share of this major U. S. wax market. Nor is the company overlooking such enticing fields as carbon paper, printing inks, candles, cosmetics, and coated papers.

Incidentally, Abril frowns on use of the terms "substitute" or "replacement" —regards its products as novel compounds which supersede many waxes.

At the moment one of the headliners is the 285°C wax. Its high melting point makes it a candidate for paper-coating—particularly the treatment of food cartons, etc., which must withstand hot liquids.

JACOB LISS: A keen eye on world wax markets.

SWEET PLASTICS STORY

Before many years you may find sugar in your varnish—in the form of allyl sucrose, a promising resin.

A FAMILIAR Ph.D. exam catch question, "What pure organic chemical is produced in greatest quantity?", is supposed to be answered, "Sugar."

Its major use, of course, is as a food; but a promising industrial application may materialize commercially when rationing is a thing of the past. This is octaallyl sucrose, a varnish resin the properties of which may qualify it as a serious contender for a share of that market.

Starch Sparked the Project

It started with allyl starch, which was developed at the Eastern Regional Laboratory of the U. S. Department of Agriculture over two years ago by Dr. Yanovsky. This material dissolves in acetone, alcohol, chloroform, benzene or toluene and, applied to surfaces of wood, metal or paper, leaves a smooth coating of high gloss upon evaporation of the solvent and after curing for a short time at 175°F. These coatings are said to be resistant to all solvents, hot oils, reasonably strong acids and alkalies, and temperatures up to 400°F.

Sugar Followed

An experimental run with sucrose was made in the course of this development, and the results looked good. Sugar utilization, however, is not in the province of that Laboratory, so the Sugar Research Foundation arranged to put its own man there on a fellowship basis.

The Foundation "feels good about the prospects," says Director Robert C. Hockett. Early runs required a high-vacuum distillation to give a clean product, but the process has now been worked out so that only a water wash is necessary. Varnish formulations employ regular paint driers—cobalt salts and the like —rather than peroxide catalysts, which seem to have no effect.

Compatibility of allyl sucrose with varnish solvents is better than that of allyl starch, and the ultimate cost will be low enough, it is hoped, to enable it to compete with present commercial coating resins.

Here Shell Chemical Co. should get part of the credit. It has made allyl chloride cheap enough so that the process, which is simply allylation of sucrose with allyl chloride in the presence of an alkali, is commercially feasible.

More in the Future

America's collective sweet tooth is still demanding more sugar than it can get, but eventually—perhaps in two years— there will be enough to go around; then technical utilization can be considered seriously. In the meantime a pilot plant is planned (a Monel autoclave has already been purchased) to turn out experimental batches.

E. YANOVSKY: Feels good about the prospects.

MOISTURE SLEUTH

Infra-red absorption permits detection of as little as one part per million of moisture in Freon refrigerants.

WATER in refrigerants can be very harmful: it freezes at the valves, corrodes metal parts and forms objectionable sludge. For these reasons it is desirable to keep water content below ten parts per million, and preferably only four or five.

The finished refrigerant after drying may contain as little as one or two parts of water per million, but keeping it that dry while it is transported to the final distribution point and packaged in cylinders requires utmost caution and continual control.

Old and New Methods

Previous analytical methods depended upon passing samples of the refrigerants, through moisture absorbents, such as phosphorus pentoxide, and carefully weighing the water pick-up. This method is tedious, however, requiring four hours per analysis, and is accurate only to about two parts per million.

Infra-red light of 2.67 microns is absorbed strongly by water but hardly at all by Freon refrigerants. This circumstance is put to use in a new analytical technique employing infra-red spectrometry. Light of the proper wave length is passed through a transparent cell containing a sample and the absorption measured and automatically recorded. Accuracy is one ppm and the analysis takes only five minutes.

SUPER-GAS SYNTHESIS

Triptane, the highest octane fuel known, can be made commercially as soon as aviation engines are developed to take advantage of it.

THE ISOMERIC form of heptane known as Triptane is 2,2,3-trimethyl butane. This hydrocarbon, which cost over $1 a gallon when it was first made, has the highest octane rating of any hydrocarbon. Now that a commercially practicable process for its synthesis has been worked out by Universal Oil Products, more intensive development and wider use of high-compression engines will undoubtedly follow in short order.

The process, first discovered in 1943 but kept in wartime secrecy wraps until now, starts with a mixture of isomeric octanes obtained by polymerization and hydrogenation of lower hydrocarbons from petroleum cracking. Two of these, the 2,2,3- and 2,3,3-trimethylpentanes, differ from Triptane only in that there is an extra methyl group at the end of the chain. Removal of the methyl group is accomplished by cleavage with hydrogen. At 500°F., in the presence of a nickel or cobalt catalyst and at 100-500 psi, hydrogen splits the chain, giving methane and Triptane. Other octane isomers give other heptanes and hexanes, but the Triptane concentration is high enough to permit practical recovery.

Demethylation is selective in that the less carbon atoms there are attached to a particular carbon atom, the more easily is one of them detached.

CLINICAL COMPOUNDS

Several synthetic organic compounds of many different types are undergoing clinical testing for therapeutic value.

Thiouracil, which was found some time ago to be of value in Grave's disease and other symptoms of thyroid overactivity, will likely be replaced by 6-propylthiouracil, a derivative which is two and a half times as effective and less toxic.

The effectiveness of many natural antibiotics has been shown to depend to a great extent on unsaturated ketone groups. A similar series of compounds, consequently, is being studied at Rutgers University. Among the most promising are phenyl vinyl ketone and its derivatives, some of which prevent growth of ringworm fungi at dilutions as high as 1:3,000,000.

A class of sleep-producing drugs derived from urethans and known as azamalonic esters has been prepared at Purdue University. It is hoped that they will rival the barbiturates in effectiveness. Similar studies are under way at the University of Michigan on a series of compounds related to the potent German analgesic, Amidone.

NIAGARA'S SMOKE PALL: "No person shall cause, suffer or allow . . ."

UTOPIA NOW?

A vigorous air pollution control campaign, vested with unique legal powers, concerns chemical makers and establishes a worrisome precedent.

LONG-proud of its scenic attractions, Niagara Falls, N. Y., has come to grips with an old problem—air pollution. The same torrent of water that made it an exciting tourist haven has made "The Falls" a thriving industrial center. But the dust and fume of industry has irritated the sensitive nostrils of the housewife, caused an occasional excursionist to look askance. The resulting political pressure produced a new Department of Air Pollution Control.

This month the recently-formed Air Pollution Control Board is holding hearings on its tentative rules and regulations, some of which have been giving chemical industry leaders bad dreams. A fear: it may be a pattern other cities will follow.

How It Began

A year ago the city officials started to work on the problem with the idea of drafting control legislation. The first steps involved collecting copies of ordinances from other cities and surveying conditions in Niagara Falls.

According to the survey the chief sources of dust, smoke, fume, odor, etc., were the chemical plants in the area. Singled out particularly were lime dust from carbide manufacture, abrasive dust, chlorine and bromine. Also named were plants making aluminum, soda, potash and graphite.

Early last fall an ordinance was drawn up and criticised at public hearings. A revised version of the bill was passed early in October 1946.

The law states, "No person shall cause, suffer or allow to be discharged into the open air any emission of dusts, gases, fumes, mists, vapors, smokes and odors which shall be beyond the limits prescribed by the rules and regulations of the Air Pollution Control Board." The ordinance itself sets forth no rules. It merely provides for a Control Board and a Director of Air Pollution Control.

The Powers That Be

The director is empowered to enforce the rules set by the board, to investigate the emission of dusts, fumes, etc., and to recommend rules for adoption by the Board. The Board, subject to the approval of the City Council, adopts rules it deems necessary.

The Board's prerogatives are broad. It may rule on the emission of dusts, fumes, etc.; on the installation of equipment emitting nuisances; and, on the alteration of facilities considered to be offending. Significantly the Board does not have to show prior proof of niusance before it can deal with a problem. And, the Board hears all appeals from the Director's decisions.

The law setting up the control Board was rushed through before many of the industries affected knew what was going on. Only a handful of company representatives were present at the hearings on the ordinance. Now another hearing is in progress—this time on the rules and regulations promulgated by the new Board.

Industry Prepares Its Case

This time most of the local industries are ready. Tentative rules, (the winter's work of the Board) were published a couple of months ago. To many they comprise every aspect of all other city ordinances rolled into one.

A number of features of the regula-

THE CONTROL BOARD: ". . . which tend to create a nuisance."

tions are particularly worrysome: What constitutes a nuisance is too broadly defined—it could be read to mean that any isolated complaint or annoyance makes a public nuisance. Certain corrective measures are too narrowly specified—mechanical installations for handling dusts are stipulated in detail without regard to other means of mitigating the trouble. Some rules state that abatement devices must remove 75% of the offending material, whether the total amount constitutes a nuisance, or whether the remaining 25% may still be objectionable.

Impractical?

Industry is also concerned because the regulations seem to imply that any effluent problem can be solved by installing more equipment. Plant engineers know that equipment to handle some dust conditions just hasn't been built. For some problems there is no known method of control. Others require considerable experimental investigation to develop adequate methods. Then there are some nuisance conditions that occur only at infrequent intervals through accident, or unfavorable combinations of circumstance—including the weather.

Most of the chemical industry is well aware of its public responsibility—is very conscious of its public relations. Many plants at "The Falls" have devoted years of study and spent thousands of dollars seeking solutions to their air pollution problems. They favor in principle, the control of air pollution. But they have a long experience with the problems involved. They are anxious to have regulations they can live with.

Opinion Differences

The Air Pollution Control Board is understandably eager to find a quick and sure remedy. But its zeal in making rules suggests that it expects Utopia now. Industry hopes to put across at the current hearings some points derived from long experience: that it is aware of its public responsibility and very willing to cooperate; that industry's actively working on the problems but some of the problems will take time to solve; and, that certain occasional freak occurrences don't necessarily constitute a general public nuisance.

STARTING SALARIES

Up and up and up they go; where they'll stop, nobody knows.

ARE YOU in the market for a June graduate in chemistry or chemical engineering? You can probably still find one if you hunt, but don't be shocked by the price tag.

While industry is seeking new chemical personnel in unprecendented numbers, colleges and universities throughout the country report that the supply of new chemists and chemical engineers will not reach prewar rate until next year at the earliest. This set of circumstances has created a situation where chemical graduates this year are commanding the highest starting salaries in history. Also, the slight but time-honored money advantage long enjoyed by chemical engineers over chemists has disappeared. The current starting ranges for both groups, according to an informal survey by CHEMICAL INDUSTRIES, is as follows: bachelors, \$175-300 per month; masters, \$275-325; doctors, \$375-400.

Median for Bachelors, \$250

A close to median salary for bachelors is \$250. The rates actually being paid for men in this group vary widely, however, as a result of armed service allowances which are granted by many companies in addition to an established base rate. Most companies seem to prefer a flexible allowance arrangement, where the amount granted is determined by the merits of the individual case. In those few cases where the allowance is fixed, it generally amounts to \$10 to \$15 per month for each year of service.

Although not particularly reflected in the salaries, there appears to be a more severe shortage of men at the graduate than at the bachelor levels. Several company scouts report that Ph.D. chemists are particularly scarce, while a sampling of schools indicates that most of the June doctors and available masters have been placed. Even men with graduate degrees in chemical engineering are in brisk demand, which is something of a changed picture from prewar days when industry showed a relatively minor interest in chemical engineering training beyond the bachelor level.

Graduate school enrollment in most institutions is considerably higher than prewar. In view of the many lucrative bids from industry, this might seem a little strange, but here is how one college professor explains it: "There are a lot of high paid jobs floating around, but these boys are looking ahead. They know what they want, and they have a pretty good idea of what it will take to get it." Another had a more prosaic explanation: "A good many of the veterans with prewar degrees are enrolling in graduate school to brush up." He hastened to add, however, that "this doesn't mean graduate standards are being lowered."

In speaking of undergraduate enrollment, which is largely veterans, one midwestern professor of chemical engineering said, "Our sophomore and junior classes are so big we don't know what to do with them all. We can't weed them out either—they're too good." Typical of swollen undergraduate enrollments are these figures from the University of Michigan chemistry department: freshman chemistry students, 1700 as against a prewar peak of 1100; total chemistry enrollment, 3400 as against 2700 prewar.

When Will They Catch Up?

What these oncoming hordes of undergraduates mean in terms of future supply of men is something employers can't agree upon. Some see supply coming into balance with demand in another year or two. Others predict a serious shortage of chemically trained men for at least five years. In one respect, however, they see pretty much eye to eye: the annual technical manpower needs of chemical industry are going to level out at a much higher rate than prewar, not only because of the wartime expansion of the industry, but also because the time is not far away when marketing departments of chemical companies will be as solidly staffed with technically trained people as are the operating and research departments today.

POTASH AND PILLS

H e y d e n Chemical Corporation, guided by Barney Armour, went shopping and came home with some profitable properties.

PENTAERYTHRITOL, penicillin, potash, and pills are all coming in for a share of Heyden Chemical Corporation's solicitude nowadays. These and several hundred more chemicals and drugs now fall within Heyden's purview.

B. R. ARMOUR: It will never be dull.

And, apparently, diversity pays. For this month the company's annual report revealed sales of $18.8 million—a nice gain over the previous annual period—and the eighth successive year that sales have increased. Consolidated net assets likewise have risen from $15.8 million to $23.1 million; net profit stands at $2.4 million.

And a good deal of the striking gain in assets is the result of several spectacular acquisitions Heyden has made within the past year and a half.

Drugs, Plastics, Potash

First of all, on the last day of 1945, Heyden picked up C. E. Jamieson & Co., Detroit manufacturer of drugs and pharmaceuticals. With it went C. E. Jamieson & Co. Ltd., (carrying on a similar business in Canada).

The next month it bought out the interest of S. Karpen & Bros. in American Plastics Corp. (plastic molders and extruders), thereby raising its share of ownership to two-thirds.

The Alien Property Custodian, two months later, put up for sale the German-owned stock of profitable American Potash and Chemical Corp.—makers of soda ash, salt cake, potash and lithium salts, borax and bromine. Promptly in stepped Heyden and bought 106,000 shares for just over $3.5 million. With this 19.2 per cent interest in Potash, Heyden's president moved in as chairman of the board and three other Heyden men were named to the board of directors. Now American Potash is planning to spend $6.8 million for a soda ash and borax plant, a power unit, and research and engineering facilities.

In May, Heyden entered another field, bought (for $1.7 million) the Princeton, N. J., penicillin plant it had operated during the war.

Late last summer Heyden paid $1,060,-000 to WAA for the phenol plant at Memphis, Tenn. which had been built during the war and was to have been operated by Southern Acid & Sulphur Co. (Army phenol needs dipped and the unit was never operated.) At present Heyden is operating the plant as a caustic soda-chlorine unit, selling some of its output, using some for making chlorinated benzenes. Eventual production of phenol is contemplated but not definitely scheduled. About the same time Heyden agreed to operate the Government's anhydrous ammonia plant at Morgantown, W. Va., on a cost-plus-fixed-free basis.

Late last year the company announced plans to build a $450,000 addition to its Fords, N. J. plant to make small-tonnage organic chemicals now being made at scattered locations.

And, just recently, for $354,000 cash and 12,000 shares of common stock, Heyden acquired the Nyal Company—distributors of some 200 over-the-counter drug items through several thousand franchised outlets.

Architect Armour

That's the story—but what ties it all together? Mostly the business daring of Heyden's president, Bernard R. Armour.

But the possibilities of future integration can be seen. Heyden is a major consumer of phenol, important producer of formaldehyde, and many pharmaceutical chemicals. At present all Nyal-brand proprietaries are still being made by Frederick Stearns (division of Sterling Drug). But new Nyal lines are to be added, and Jamieson will make them—probably make more and more in the future. There are other factors too—pointing to a degree of vertical integration.

All companies are but the extended shadow of a single man, and Heyden is no exception. The man is Bernard R. Armour, inveterate board member, who sits with the directors of all Heyden's holdings. His mid-Manhattan office is decorated with framed checks, issued to consummate business deals, and clippings highlighting the dividend and sales records of his enterprises.

Origin

The entire Heyden history involves the interrelations of Armour, the Denhey (transpose the syllables) Holding Corp. and the Chemische Fabrik von Heyden.

After a series of involved deals which took place between 1925 and 1943 the present corporate set-up of Heyden Chemical Corp. came into being. Armour's interests in that period had not been confined to Heyden and its ramifications. He has holdings in American Aniline Products Co., is president of Hartford Rayon, personally owns 67 per cent of National Capsule Co., and is a director of a dozen other concerns.

But not all he touches turns to gold. Some ten years ago he gained control of Rademaker Chemical Co., Eastlake, Mich. —maker of bromine and other chemicals from brine. A consistent money-loser it failed to show profit even during the lucrative war years.

Heyden, on the other hand, is doing all right. Sales have climbed steadily every year from $6 million in 1940 to over $18 million last year. Net profits tacked upward in the same period from $808,000 to $2.4 million.

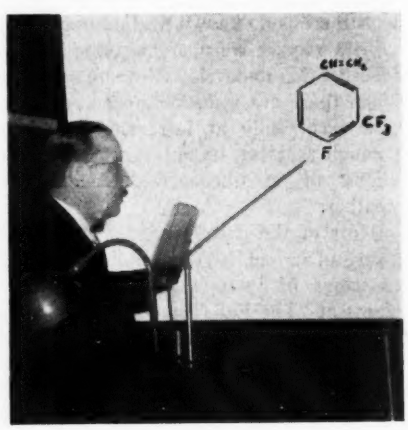
One thing is sure: Even though Heyden's voyage is smooth—and such it certainly appears to be—with Barney Armour at the helm it will never be dull.

FLUORO-RUBBER

Fluorine derivatives of styrene improve properties of butadiene-styrene, or GR-S, synthetic rubber.

MODIFICATION of the styrene molecule by inclusion of fluorine atoms gives monomers which copolymerize with butadiene to give superior GR-S rubbers. Desirable properties of these rubbers are higher tensile strength at elevated temperatures and better hysteresis characteristics. Many of them also polymerize to give brilliantly clear, hard polystyrenes.

Several of these fluorine-substituted



G. B. BACHMAN: Lower cost is the key.

styrenes have been prepared by G. Bryant Bachman and his co-workers at Purdue University. Among them are *p*-fluorostyrene, *m*-trifluoromethylstyrene, the one with both of those groups present, and several with methyl groups attached to the carbon atoms in the side chain.

No one will be riding on fluoro-rubber tires this year, or even, by all odds, in five years. Preparation of these compounds at the present time requires a series of difficult, laboratory-type reactions which precludes their economic utilization.

But fluorine is still in its swaddling clothes. Industry has not yet found wide use for it, said one chemist close to the development, but when its cost comes down to an expected 50c per pound, industrial interest will heighten. Research has a way, too, of finding simple production routes to replace laborious, multistep syntheses.

Perhaps the next generation will ride on fluorine rubber and, incidentally, use the element in many other chemical ways.

CROP FOOD OR A-BOMB?

The Texas City ammonium nitrate explosion has caused chemists to reexamine their ideas about this Jekyll and Hyde material.

"A CRYSTALLINE powder varying in color from almost white to brown, hygroscopic, relatively insensitive and can be detonated only by very strong initiation. It usually cannot be detonated by heat or friction. It may be exploded by relatively light initiation if it has been sensitized by certain impurities, such as carbonaceous materials. It is not very inflammable at atmospheric temperatures, but fires involving large quantities become an explosion hazard."

That is what the *Ordnance Safety Manual,* published by the war department just six days before Pearl Harbor, has to say about ammonium nitrate, plant fertilizer in peace and explosives component in war.

When the authors wrote of "very strong initiation" they were probably thinking of Oppau, Germany, where 500 were killed and 2,000 injured when tons of the caked material were being broken up by dynamite. "Even in this case," Army Captain Dutton has written, "very special circumstances of high temperature, strong confinement, finely divided state and the use of a violent priming explosive prevailed." Not until Oppau had ammonium nitrate "been known to explode without the admixture of some combustible."

How dangerous is it?

Everyone will agree that ammonium nitrate can be detonated under extreme and unusual conditions, but guesses as to the degree of extremity or unusualness required are at wide variance.

The Bureau of Explosives, of the Association of American Railroads, classifies the chemical as an oxidizing material, for which packing requirements are not severely rigid. It can be shipped in burlap or paper bags, and the boxcar does not have to be placarded "Danger" unless it is shipped in bulk. Inspector George of the Bureau reports that laboratory tests fail to disclose any danger under conditions likely to be encountered in rail transportation, and he does not contemplate any changes in present regulations unless pressure is brought to bear upon the Bureau as a result of the Texas calamity.

The Port of New York, on the other hand, prohibits loading of ammonium nitrate, among some 90 other dangerous materials, from city docks. If a nitrate-laden ship wants to enter the harbor to pick up other types of cargo, the fact must be reported so that inspectors can board the vessel and see that all hatches are battened down. The additional cargo, moreover, cannot be loaded on top of or near the nitrate.

Was it sensitized?

It would be a lot easier to explain the Texas City explosion if it could be shown that the ammonium nitrate on the vessel Grand Camp was contaminated with organic material.

The Bureau of Explosives dashed this possibility when it reported that preliminary tests on material from the same lot showed nothing out of the ordinary. Whether contamination occurred aboard the ship will, of course, never be known, for that nitrate is all gone.

If it is true that "extreme and unusual" conditions are necessary for ammonium nitrate to detonate, then Texas City is tragic proof that such conditions do occur. There is a great deal of sentiment to the effect that even though chances of its happening under present handling practices may be only one in a million, that's one too many.

122.5% SULFURIC

A new stabilizer opens broader fields for sulfur trioxide.

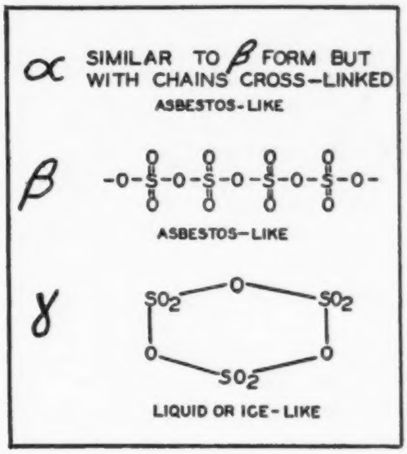
EVEN THOUGH sulfur trioxide has been a major chemical product for years (all sulfuric acid made by the contact process is formed by hydration of the trioxide) virtually no trioxide has been sold as such. The reason: upon long standing SO_3 polymerizes, and the polymer is almost impossible to remove from the storage vessel.

In view of the many potential uses of sulfur trioxide numerous attempts have been made to stabilize the chemical. However the stabilizing agents suggested—such as chlorosulfonic acid and acetic anhydride—can be regarded more as diluents rather than stabilizers. But recently a novel, effective stabilizer has been developed by General Chemical Co., which, used on a basis of less than one per cent, renders SO_3 stable. As a result, General is now marketing the trioxide on a semi-commercial basis—is in a positi n to go into tonnage production as markets develop.

The Key

Development of stabilized SO_3 came about as a result of intensive studies of the chemistry of polymerization. The consensus: upon standing solid sulfur trioxide polymerizes to the low vapor pressure alpha isomer, which sublimes upon heating and does not melt at atmospheric pressure.

Too, the low heat conductivity of the thus-formed polymer causes spot overheating until the pressure builds up to the point where it can form a liquid phase, the gamma isomer, (the only one found as liquid trioxide). This liquid isomer possesses a much higher vapor pressure than the solid alpha material. The result is an extremely rapid vaporization—the so called "alpha explosion."



The availability of SO_3 points to many fields of promise, for it can be used as a sulfonating agent and as a synthesis intermediate for a host of products running the gamut from dyestuffs to detergents.

Prospects

One example of its possible utility is in the preparation of naphthalene trisulfonic acid. By the classical procedure this reaction requires nearly four moles of free SO_3 (as 65% oleum) and nearly 4.5 moles of sulfuric acid to add three sulfonic acid groups. The pure trioxide promises a theoretical reduction of over 5 moles in the consumption of acid or anhydride for this sulfonation. This is accomplished by reduction in the solvent sulfuric acid, and in the acid or SO_3 needed to absorb the water liberated by the reaction.

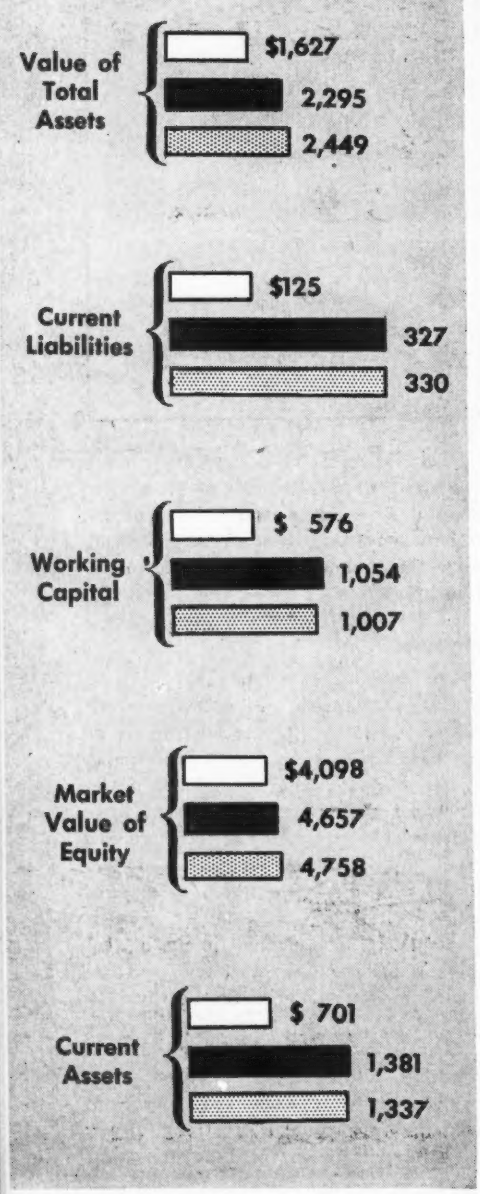
That is but one example. And, significantly, although the stabilized material is expected to command a premium over the SO_3 content of strong oleum, its price will be in the heavy chemical range.

COMPARATIVE FINANCIAL SUMMARY OF 25 CHEMICAL COMPANIES FOR THE YEARS 1939, 1945, 1946

Year 1939 1945 1946

NOTE: 1939 balance sheet figures for Chas. Pfizer & Co. excluded from table for lack of data, and American Cyanamid Co. sales for 1939 are estimated.

DOLLAR FIGURES IN MILLIONS; balance sheet figures are at year end



Chemical Companies Report

DESPITE STRIKES, MATERIAL SHORTAGES and higher costs, most chemical companies can look back on 1946 as a year of profitable operations. In other things than earnings, however, balance sheets and income statements are not greatly changed from 1945. In any period of readjustment which may be in store, the majority of chemical makers are favored by their basic position in the economy and their extremely strong financial conditions.

LAST year aggregate net income of twenty-five leading chemical companies totalled $279 million, or 46 per cent above the 1939 figure. This is the first time since prewar years that these companies have shown a material improvement in earnings. The principal reason is the elimination of the excess-profits tax last year.

It is evident from Table I, however, that the increase in net income from 1939 to 1946 (46%) has not been commensurate with the increase in sales (136%) during that period. Largely responsible for this relative shrinkage in earnings is the higher corporate tax rate, which is 38 per cent of taxable income compared to approximately 18 per cent in 1939.

From the end of 1939 to the year ended 1946, the twenty-five chemical companies increased their assets by approximately $800 million or 50 per cent. The change in total assets from 1939 varied, of course, with different companies. Dow Chemical, for example, had a substantial increase in assets—from $41 million at the end of May, 1939, to $128 million at the 1946 fiscal year end.

Sales per dollar of total assets for all the companies amounted to $1 last year compared to 64 cents in 1939. Thus, a comprehensive sample of the industry indicates an improvement of about one-third in the utilization of assets, using dollar sales as the unit of measurement. Since the general level of prices is higher now than in 1939, the comparison of sales in terms of total assets is somewhat distorted. But there is little question that in 1946 these companies were utilizing their assets more intensively than in 1939.

CURRENT POSITION

The current position of the twenty-five chemical companies at the end of 1946 changed very little from the year end 1945. At the end of 1946, however, current assets were over $600 million greater than at the end of 1939. The percentage increase was 91 per cent. Current liabilities increased between the two periods by 164 per cent or about $200 million. The ratio of current assets to current liabilities was 4.1 to 1 at the end of 1946 compared to 4.2 to 1 at the end of the previous year and 5.6 to 1 at the end of 1939. The excellent financial position generally maintained by these companies in the aggregate is still being preserved. Working capital at the end of 1946 amounted to $1 billion or 74 per cent above the 1939 year end figure. The increase in volume of sales since 1939 has necessitated the building up of larger working funds.

That the twenty-five companies have financed their growth in assets and sales in a very sound manner is indicated by the changes in debt, preferred stock and common stock and surplus in the seven years since 1939. During this period, the companies increased debt by $36 million, preferred stock by $71 billion, and common stock and surplus by $610 million. It is apparent that the principal means by which these companies have expanded their facilities and operations is by ploughing back earnings. Three large companies—American Cyanamid, Dow and Monsanto—have increased their debt or preferred stock capitalization in significant amounts. These major units in the industry, however, show substantial expansion in assets and sales.

Net income of the twenty-five companies totalled $279 million in 1946, or 46 per cent above the 1939 figure. For the first time since pre-war years, there has been a material improvement in net income. The principal reason for this change was the elimination of the excess-profits tax last year. It is evident from Table I, however, that the increase in net income from 1939 to 1946 (46%) has not been commensurate with the increase in sales (136%) during that period. Largely responsible for this relative shrinkage in earnings is the higher corporate tax rate, which is 38 per cent of

Record Earnings in 1946

by MICHAEL PESCATELLO
New York, N. Y.

taxable income compared to approximately 18 per cent in 1939.

OPERATING INCOME

The net operating income figure is of particular interest because it provides a good measure of the changes in costs of doing business. Specifically, last year the twenty-five companies reported net operating income of $406 million, an increase of 124% over the 1939 figure of $182 million. Since sales increased by 136%, it is evident that the companies as a whole have experienced a slight squeeze in profit margins. In 1939, net operating income amounted to 17.5% of sales compared to 16.5% last year. The table indicates that there was an improvement in profit margins in 1946 over 1945, due probably to the removal of price controls which enabled businesses to bring more into line the prices of products sold with operating costs.

NET WORTH

Net worth of the twenty-five companies amounted to $2.1 billion at the end of 1946. This represented an increase of approximately $700 million above the figure at the end of 1939 or 46%. The increase in net worth between 1939 and 1946 was exactly the same as the 46% increase in net income. In both those years, the companies earned 12.7% on net worth.

This rate of earnings on net worth is of particular importance at this time for two reasons:

First, a 12.7% return is moderate in comparison with practically any other industry not subject to formal regulations like public utilities and railroads. Many segments of industry showed substantial rates of return on net worth in 1946, notably retail trade, amusements, textiles, drugs and rubber, all of which in the aggregate had a rate of return above 20%. A sample of over 1,000 companies in manufacturing shows a rate of return on net worth of 12.1% in 1946. It appears, therefore, that chemical companies, as a whole, have exercised diligence and restraint in serving their widespread markets. This observation cannot be applied to a great many other industries and companies, especially those serving consumers directly. In many cases, substantially higher earnings and rates of return have served to intensify the inflationary spiral and invited consumer resistance.

Second, the twenty-five chemical companies earned the same rate of return last year as in 1939. Inasmuch as the demand for products has exceeded available supply, the chemical industry could probably have earned a higher rate of return by increasing earnings through materially higher prices. The improvement in rate of return from 9.4% in 1945 to 12.7% in 1946 reflects a change from the cost-price abnormalities prevailing in the former year.

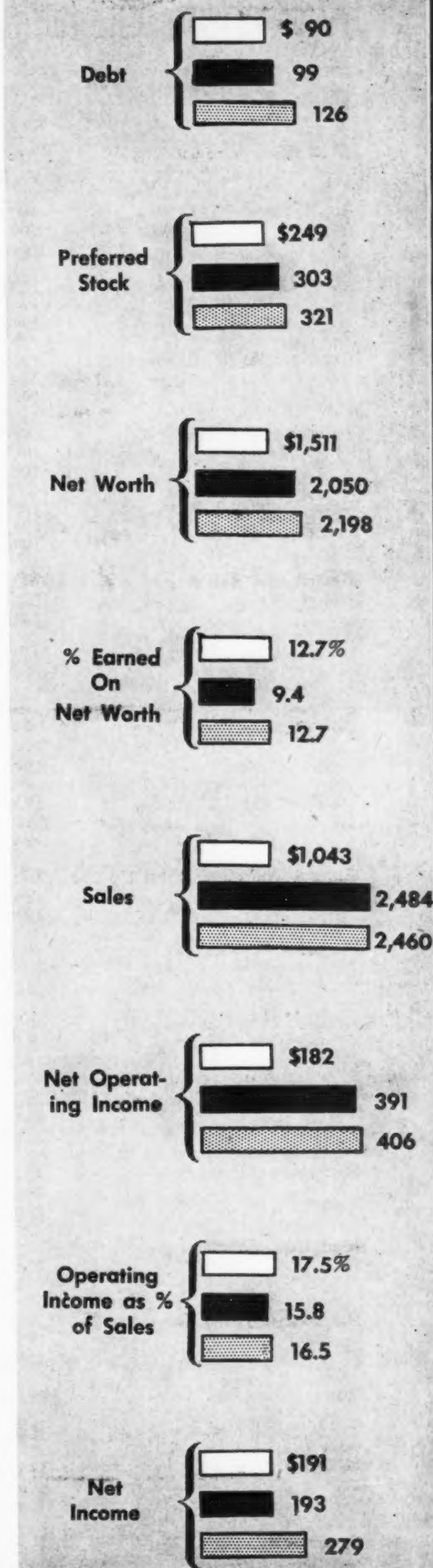
DIVIDENDS

In 1946 the twenty-five companies paid out $163 million in common dividends. This was $21 million or 15% greater than dividends paid out in the year 1939. The proportion of dividends paid out was 59% of net income last year compared to 74% in 1939. The combined companies, therefore, have continued their conservative course in the matter of dividend payments. It is interesting to note that the total market value of their equities at the end of 1946 showed approximately the same amount of increase over the year end 1939 market value as dividends paid out. Thus, investors have been evaluating common stocks more on the basis of dividends paid than on net income reported.

The total market value of the common stocks of the twenty-five chemical companies was 21 times earnings in 1939, 24 times in 1945 and 17 times in 1946. For a number of years past, the market has been willing to anticipate better earnings by marking up the value of equities. This was not the case at the end of 1946 nor in the first part of 1947. There is, it appears, a justified fear and uncertainty regarding the economic outlook in the immediate future. Even in the case of the soundly established enterprises in the chemical industry, there is a hesitancy to value earning prospects except on a conservative basis.

BASIC POSITION

In former periods, the existence of a large and potential demand for goods, an expanded productive capacity, low money



TWENTY-FIVE CHEMICAL COMPANIES—COMPARISON 1946, 1945 AND 1939

		Year End										
							Par Value					
(All figures in millions of $)	Year	Market Value of Equity	Total Assets	Current Assets	Current Liabil.	Working Capital	Debt	Pfd. Stock	Sales	Net Oper. Inc.	Net Inc.	Common Div's.
Air Reduction (1)	1939	$146.1	$38.7	$20.0	$3.4	$16.6	...	...	$27.6	$6.0	$5.1	$3.8
	1945	149.5	77.4	47.1	10.4	36.7	$24.0	...	80.7	10.3	8.3	5.5
	1946	**95.8**	**75.4**	**39.2**	**8.6**	**30.6**	**23.0**	...	**71.2**	**6.4**	**4.5**	**4.1**
Allied Chemical & Dye (1)	1939	391.9	207.7	108.1	12.5	95.6	...	...	168.0	23.3	21.0	19.9
	1945	411.8	243.1	187.9	26.4	161.5	...	...	267.6	27.8	18.9	13.3
	1946	**378.6**	**258.4**	**181.2**	**31.3**	**149.9**	...	...	**280.9**	**41.1**	**26.7**	**17.7**
American Agric. Chemical (2)	1939	12.6	21.5	14.3	0.8	13.5	...	...	17.6	0.73	0.76	0.87
	1945	26.4	30.6	21.1	6.4	14.7	...	...	34.9	4.4	1.7	1.3
	1946	**25.1**	**32.5**	**22.9**	**6.4**	**16.5**	...	...	**36.9**	**5.2**	**3.0**	**1.4**
American Cyanamid	1939	89.0	77.3	39.4	9.0	30.4	12.0	$4.7	75.0E	6.4	5.5	4.2
	1945	132.6	145.3	94.1	22.2	71.9	40.0	14.8	159.0	10.1	6.2	3.4
	1946	**150.6**	**162.1**	**87.0**	**31.8**	**55.2**	**42.0**	**14.8**	**178.9**	**14.3**	**8.7**	**4.1**
Atlas Powder (3)	1939	16.0	18.4	9.4	1.3	8.1	...	6.8	16.5	1.5	1.3	0.75
	1945	23.6	27.6	18.3	4.4	13.9	0.52	6.8	44.4	4.3	1.4	0.83
	1946	**16.2**	**25.3**	**15.1**	**3.6**	**11.5**	**0.52**	**6.8**	**32.2**	**1.6**	**1.1**	**0.58**
Commercial Solvents	1939	36.9	20.0	13.8	2.5	11.3	...	...	14.4	1.4	1.6	...
	1945	65.9	26.7	21.2	2.3	18.9	...	...	104.9	6.5	2.0	1.9
	1946	**58.0**	**31.6**	**18.9**	**4.2**	**14.7**	...	...	**98.4**	**8.4**	**5.7**	**2.6**
Davison Chemical (2)	1939	3.6	11.7	6.1	0.3	5.8	1.4	...	9.5	—0.27	—0.29	...
	1945	12.9	16.4	9.5	2.0	7.5	0.3	...	33.4	4.1	1.5	0.51
	1946	**9.3**	**16.4**	**9.9**	**1.2**	**8.7**	...	...	**23.3**	**1.6**	**1.2**	**0.51**
Dow Chemical (4)	1939	148.6	41.8	14.3	2.6	11.7	5.7	6.0	26.8	3.8	4.2	2.9
	1945	198.5	146.1	68.7	28.1	40.6	12.5	30.4	124.6	22.0	8.7	3.7
	1946	**224.8**	**128.8**	**53.2**	**13.0**	**40.2**	**0.9**	**30.4**	**101.8**	**7.8**	**6.1**	**3.7**
Du Pont (1)	1939	2,013.9	538.8	209.3	47.1	162.2	...	168.8	298.8	67.2	93.2	77.4
	1945	2,068.7	667.6	347.4	62.6	284.8	...	168.8	611.3	127.4	77.5	58.4
	1946	**2,124.3**	**700.1**	**335.3**	**74.9**	**260.4**	...	**168.8**	**648.7**	**142.5**	**112.6**	**77.8**
General Aniline & Film (5)	1939	40.8	61.5	33.9	4.4	29.5	22.4	...	25.8	3.6	4.5	1.8
	1945	55.9	78.8	55.3	13.1	42.2	9.5	...	68.7	10.4	3.9	3.2
	1946	**51.7**	**79.4**	**48.9**	**8.5**	**40.4**	**9.0**	...	**64.2**	**4.9**	**3.2**	**1.3**
Hercules Powder (6)	1939	117.2	44.1	21.6	2.9	18.7	...	9.6	41.0	6.2	5.3	3.7
	1945	150.1	72.0	50.3	15.5	34.8	...	9.6	100.6	16.3	4.9	3.3
	1946	**155.4**	**70.5**	**42.4**	**12.7**	**29.7**	...	**9.6**	**100.7**	**14.8**	**8.4**	**3.9**
Hooker Electrochemical (7)	1939	2.1	7.4	2.4	0.6	1.8	2.6	2.7	5.7	0.62	0.4	0.1
	1945	16.8	12.9	6.7	1.7	5.0	...	5.0	19.1	3.9	1.1	0.54
	1946	**20.4**	**13.8**	**5.8**	**1.7**	**4.1**	...	**5.0**	**14.9**	**2.5**	**1.7**	**0.67**
Int'l Minerals & Chemicals (2)	1939	0.9	26.7	6.5	0.4	6.1	3.3	10.0	11.7	0.16	0.13	...
	1945	19.0	37.1	13.4	1.5	11.9	8.0	9.9	30.3	3.1	2.0	0.57
	1946	**20.0**	**40.8**	**13.2**	**1.9**	**11.3**	**8.8**	**9.9**	**34.4**	**4.1**	**2.9**	**0.63**
Mathieson Alkali	1939	24.8	24.8	4.5	0.8	3.7	...	2.4	10.9	1.4	1.1	1.2
	1945	26.5	28.1	12.6	2.3	10.3	...	2.4	19.6	4.2	1.1	0.83
	1946	**24.0**	**28.9**	**10.0**	**2.3**	**7.7**	...	**2.4**	**20.5**	**4.9**	**2.0**	**1.0**
Monsanto Chemical	1939	135.3	54.7	20.8	6.0	14.8	...	11.9	42.9	7.2	5.4	3.7
	1945	148.3	79.5	43.9	7.1	36.8	...	21.0	95.3	15.0	5.3	2.8
	1946	**239.6**	**129.1**	**73.5**	**12.2**	**61.3**	**31.0**	**31.7**	**99.6**	**15.4**	**10.0**	**4.1**
National Cylinder Gas	1939	12.2	6.9	1.7	0.5	1.2	...	...	4.9	2.4	1.0	0.47
	1945	24.8	18.4	8.5	1.3	7.2	0.75	3.4	21.1	3.5	1.8	1.1
	1946	**22.5**	**20.4**	**7.2**	**2.7**	**4.5**	**0.60**	**3.3**	**19.9**	**2.9**	**2.4**	**1.3**
Nopco Chemical	1939	7.9	4.7	3.1	0.8	2.3	1.2	...	7.7	1.2	0.7	0.33
	1945	11.9	8.1	5.4	0.8	4.6	1.8	...	15.3	1.5	0.49	0.24
	1946	**10.8**	**10.1**	**6.7**	**2.6**	**4.1**	**1.4**	...	**16.9**	**2.1**	**1.0**	**0.32**
Newport Industries	1939	8.1	5.7	2.7	0.4	2.3	0.7	...	4.6	0.5	0.4	...
	1945	22.4	6.6	3.5	0.8	2.7	...	...	9.7	1.8	0.63	0.50
	1946	**18.6**	**12.5**	**7.3**	**1.7**	**5.6**	...	**4.0**	**13.4**	**3.6**	**2.3**	**0.99**
Pennsylvania Salt (2)	1939	25.2	16.7	7.8	0.9	6.9	...	...	9.6	1.3	1.3	0.75
	1945	31.5	24.8	11.9	4.1	7.8	...	...	26.2	2.9	1.4	0.97
	1946	**39.0**	**23.7**	**12.5**	**2.8**	**9.7**	...	...	**22.9**	**1.4**	**1.5**	**0.97**

TWENTY-FIVE CHEMICAL COMPANIES—COMPARISON 1946, 1945 AND 1939

(All figures in millions of $)	Year	Year End: Market Value of Equity	Total Assets	Current Assets	Current Liabil.	Working Capital	Par Value: Debt	Pfd. Stock	Sales	Net Oper. Inc.	Net Inc.	Common Div's.
Pfizer, Chas. & Co.	1939	14.0E	...	...	...	...	...	...	6.2	1.1	0.87	0.73
	1945	55.1	23.7	18.6	9.4	9.2	...	...	27.5	8.8	1.8	1.3
	1946	**90.3**	**33.8**	**23.6**	**12.6**	**11.0**	...	...	**43.6**	**21.1**	**10.6**	**5.5**
Union Carbide & Carbon	1939	807.2	336.8	133.4	22.6	110.8	40.0	...	170.3	42.9	35.8	18.3
	1945	937.1	428.1	281.6	92.7	188.9	...	...	481.5	92.9	37.9	27.8
	1946	**908.5**	**439.0**	**256.9**	**80.3**	**176.6**	...	...	**414.9**	**88.9**	**57.2**	**27.9**
U. S. Industrial Chem. (8)	1939	9.0	13.8	9.8	2.3	7.5	...	...	11.9	0.10	0.08	...
	1945	20.0	32.7	18.6	6.7	11.9	...	...	40.5	2.8	1.7	0.85
	1946	**23.0**	**45.9**	**31.2**	**6.9**	**24.3**	**7.5**	...	**48.2**	**2.7**	**1.8**	**1.0**
Victor Chemical Works	1939	20.8	8.7	3.6	0.8	2.8	0.9	...	8.4	1.3	1.1	0.97
	1945	30.7	11.8	7.6	1.2	6.4	0.46	...	16.5	3.2	1.1	0.82
	1946	**36.0**	**16.8**	**8.3**	**1.4**	**6.9**	**0.53**	**4.0**	**19.4**	**3.6**	**2.1**	**1.2**
Virginia Carolina Chemical (2)	1939	1.9	25.5	10.8	1.6	9.2	...	21.3	16.8	0.43	0.51	...
	1945	3.9	33.4	18.7	3.5	15.2	1.7	21.3	33.4	2.8	0.96	
	1946	**3.2**	**34.5**	**18.8**	**3.3**	**15.5**	**1.5**	**21.3**	**36.6**	**3.2**	**1.7**	...
Westvaco Chlorine	1939	12.6	13.2	3.9	0.6	3.3	...	5.7	10.8	1.8	1.3	0.63
	1945	13.8	18.3	9.4	0.8	8.6	...	9.7	17.9	1.6	0.96	0.49
	1946	**12.4**	**19.6**	**8.4**	**1.5**	**6.9**	...	**9.5**	**17.8**	**1.6**	**1.1**	**0.49**

(1) Certain outside investments of these three companies are excluded from total assets in the amounts shown below. Also shown is other income which is not excluded from net income.

	Year	Outside Investments excluding U. S. Gov't. Sec. million $	Other Income 000 $
Air Reduction	1939	$5.5	$67
	1945	5.6	503
	1946	6.0	834
Allied Chem.	1939	28.9	1,698
	1945	42.8	3,100
	1946	42.9	3,800
du Pont (Gen. Motors Invest.)	1939	197.0	35,000
	1945	254.0	30,000
	1946	264.5	22,500

(2) Year or year ended June 30th.

(3) Goodwill amounting to $4.1 millions excluded from total assets.

(4) Year or year ended May 31st.

(5) Equity value represented by 527,665 "A" shares in 1946 and 1945 and 529,693 shares at the end of 1939.

(6) Goodwill amounting to $5.0 million excluded from total assets in 1939.

(7) Goodwill amounting to $2.5 million excluded from total assets in 1939.

(8) In 1946 and 1945, data are for year ended March 31st except value of equity.

rates, a wide credit base and a substantial supply of money were regarded as the principal requirements for a prosperous level of business. All those factors have been present in recent months and are present currently. Yet, there is a strong undercurrent of pessimism flowing through the economy. There are at least four underlying reasons for this condition, none of which are conducive to a healthy economy. These are (1) an abnormally high price level which is cutting down purchasing power to a substantial degree at the consumer level, (2) regressive taxation which is doing the same thing, (3) the existence of strong pressure groups creating severe distortion in wages, prices and costs, and (4) direct and indirect Government supervision or control over large segments of the economy. The reason for pessimism is not only that the conditions enumerated above are present, but also that there appears to be little prospect for improvement.

In any period of readjustment which may occur in the future, the chemical industry is favored by its fundamentally sound position, serving, as it does, all industries with basic product requirements. There have been only limited increases in chemical product prices generally, and the industry's earnings have shown comparatively moderate increases in relation either to sales or net worth. In addition, chemical companies have maintained excellent financial positions. The industry is not immune to adverse changes in economic conditions, should they occur, but its inherent strength demonstrated in the past is a bulwark against any serious adjustments that may eventually take place.

Table II—Summary of Principal Financial Data of 25 Chemical Companies for the years 1946, 1945, 1939

(Dollar Figures in Millions)

Year	*Year end: Market Value of Equity*	*Value of Total Assets*	*Current Assets*	*Current Liabil.*	*Working Capital*	*Par Value: Dept*	*Pfd. Stock*	*Net Worth*	*% Earned on Net Worth*	*Sales*	*Net Oper. Income: Mil.*	*% of Sales*	*Net Inc.*	*Com. Div's.*
1939	$4,098.6	$1,627.1	$701.2	$125.1	$576.1	$90.2	$249.9	$1,511.7	12.7%	$1,043.4	$182.3	17.5%	$191.6	$142.5
1945	4,657.7	2,295.1	1,381.3	327.3	1,054.0	99.5	303.1	2,050.0	9.4	2,484.0	391.6	15.8	193.2	134.1
1946	4,758.1	2,449.4	1,337.4	330.1	1,007.3	126.7	321.5	2.198.0	12.7	2,460.2	406.6	16.5	279.5	163.7
% Change 1939 to 1946	+16	+50	+91	+164	+74	+41	+29	+46	..	+136	+124	..	+46	+15

Note: 1939 balance sheet figures for Chas. Pfizer & Co. excluded from table for lack of data, and American Cyanamid Co. sales for 1939 are estimated.

NYLON IS BIG BUSINESS

EDITORIAL STAFF REPORT

THE GROWTH OF NYLON in the 1938-1948 decade to a point where it will account for some 15 per cent of Du Pont's total sales is a phenomenon without precedent in the chemical industry. Versatile in uses as well as modes of manufacture, its V-J Day output will be tripled before 1948's end.

NYLON is eight years old, but it is still news. Everyone knows that it is made from "coal, air and water" and that its major use is to adorn a hundred million legs. Less generally known are the facts that it can be made—and, indeed, is being made—from petroleum or agricultural by-products as well as from coal, and that it is making a name for itself in plastics, paint brush bristles and other non-textile uses while at the same time its consumption for fabrics is vaulting upwards.

The hosiery market can hardly absorb more than 20,000,000 lbs. per year. The reported increase in nylon output to well over 60,000,000 lbs. by the end of 1948 tells better than words how fast these new markets are growing.

HOW IT STARTED

A taffy-like substance in a still excited the chemists working at Du Pont under the late Dr. Wallace H. Carothers. The warm material stretched; more surprising, after it cooled it could be further drawn to three or four times its original length, whereupon it became not only much stronger but also elastic.

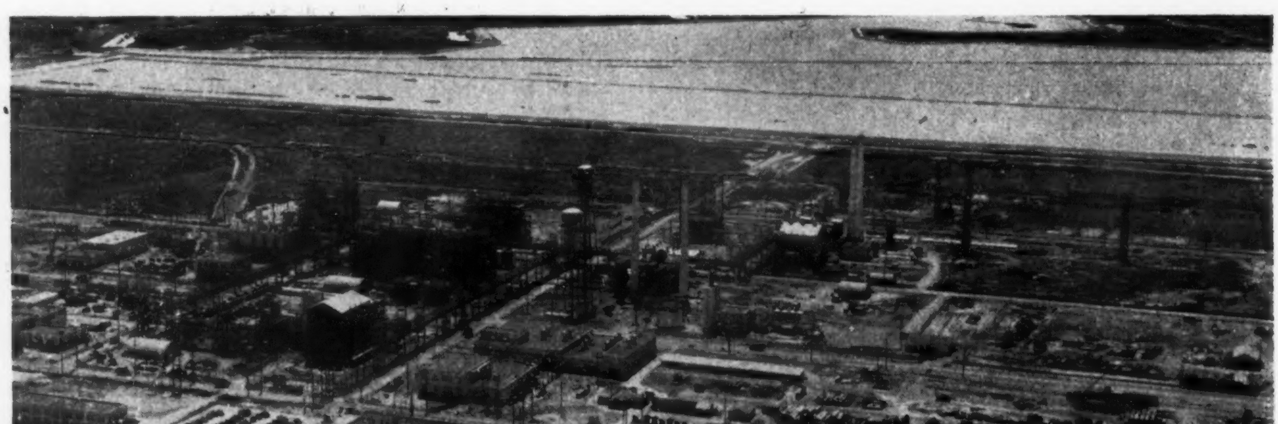
This was in 1932. Two years before Dr. Carothers had started to explore the properties of polymeric materials—a "fundamental" research project from which nobody expected any practical results for years. The impetus was the knowledge that many of the useful materials found in nature—cotton, silk, wool, rubber and resins—are polymers built up of simple, often identical, units. An intensive study of the materials and mechanics of polymerization might illumine the ways of nature and permit science to do better.

Early experiments convinced Carothers that linear polymers showed promise. His first attempts centered about polymers of the ester type, where α, ω-dibasic acids were esterified with α, ω-glycols, but they seemed unpromising and were eventually dropped in favor of the type now produced—polyamides resulting from the condensation of polymethylene diamines with polymethylene dicarboxylic acids.

Countless experiments and man-years of work were spent before the taffy-like resin of 1930 became the commercial nylon of 1938. The earlier work determined what composition gave the most desirable polymers. Spinning difficulties were a headache; but the hardest part, probably, was to solve the production problem: How could these necessary nylon intermediates, known previously only to Beilstein and I. G., be made by the ton?

PRODUCTION

A lot of possible processes were studied, but the decision was finally reached that the route via phenol was the most suitable for immediate commercialization. In this procedure, phenol is first hydrogenated to cyclohexanol which is oxidized in the vapor phase to produce cyclohexanone. Liquid-phase oxidation of the latter with atmospheric oxygen in a fatty acid carrier is utilized to make adipic acid, which gives adiponitrile by reaction with ammonia over a dehydrating catalyst. Hydrogenation of adiponitrile gives hexamethylene diamine which reacts with



Du Pont's Sabine River Works, near Orange, Texas, under construction. Nylon salt is made here from cyclohexane.

adipic acid to produce the so-called nylon salt. The fiber is spun from a melt of the polymer made from the nylon salt.

A six-step process in the chemical industry is always an invitation to find newer and less expensive syntheses, and such routes of manufacture were not long in coming. Such a synthesis is operated at du Pont's Sabine River Works in Texas. Here benzene is hydrogenated to cyclohexane which is then oxidized with atmospheric oxygen to adipic acid. Conversion of adipic acid to hexamethylene, diamine follows the same course as in the earlier process. If a sufficiently pure cyclohexane can eventually be produced from petroleum at a reasonable cost, the operations at this plant will undoubtedly be based on its use. It is reported that both Shell Oil Co. and Phillips Petroleum Co. are actively pursuing this possibility, and three runs using high purity petroleum cyclohexane have been made at Sabine.

There are two procedures by which cyclohexane can be prepared from petroleum (Crawford, CHEMICAL INDUSTRIES Sept., 1946, 470.) The first merely involves the fractionation of the higher-boiling natural gasoline cuts, while the second consists of separating methyl cyclopentane from the product of a hydroforming unit. After separation the methyl cyclopentane is isomerized to cyclohexane.

Possibly significant are the plans of McCarthy Chemical Co. to construct a $3,000,000 plant at Winne, Texas, not far from du Pont's Sabine Works at Orange. The principal products of this plant are reported to be benzene, styrene and a mixture of olefinic hydrocarbons derived from petroleum—a mixture whose composition is reminiscent of that obtained by the Catarole process (CHEMICAL INDUSTRIES, February, 1947, 226). The benzene could conceivably be used by Dupont to make cyclohexane.

Still another possibility for the oxidation of cyclohexane is the utilization of nitric acid as the oxidizing agent instead of air. This was used by the Germans in their initial preparation of adipic acid. As far as is known, the process has not been developed commercially in this country, although many patents on its use to convert cyclohexane to adipic acid are held by du Pont.

FROM FARM BY-PRODUCTS

Another process is getting under way at Niagara Falls, where du Pont is constructing a $3,000,000 plant for the manufacture of adiponitrile (CHEMICAL INDUSTRIES, April, 1947, 612). This plant is the first to side-step hydrocarbon raw materials, using instead furfural obtained from various pentosan-containing agricultural products.

The aldehyde side-chain of furfural is removed by passing the material over a catalyst composed of a mixed chromite of zinc and either manganese or iron, yielding furan, from which tetrahydrofuran is obtained upon hydrogenation. The latter reacts with hydrogen chloride to give 1,4-dichlorobutane, which in turn reacts with sodium cyanide to give adiponitrile.

Celanese Corp. has just announced the availability of tetrahydrofuran by the direct oxidation of butane (CHEMICAL INDUSTRIES, May, 1947, 766). Whether this represents a potential source of nylon raw material depends upon the quantity which can be made available by this method.

About 20 per cent of the butadiene consumed by the German synthetic rubber program was obtained by the dehydration of tetrahydrofuran produced from 1,4-butynediol. The latter material, synthesized from acetylene and formaldehyde, is now being advertised by General Aniline & Film Corp. This could serve as a raw material for nylon, either by conversion to tetrahydrofuran, or, very much likelier, by direct conversion to dichlorobutane.

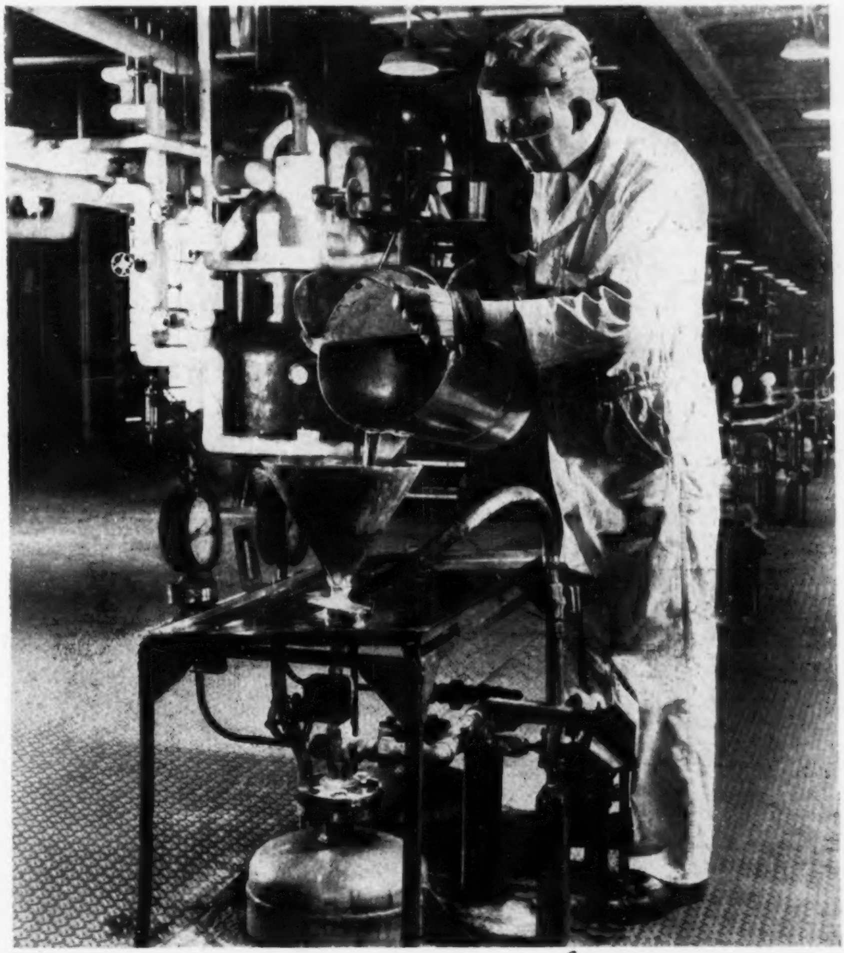
The German production of nylon-type materials never exceeded two tons per month. For these synthetics they utilized entirely different raw materials: α,ω-polymethylene diisocyanates, polymerized with glycols to form polyurethanes, and ϵ-caprolactam (CHEMICAL INDUSTRIES, October, 1945, 645), which gives a polyamide upon polymerization. du Pont has facilities to produce both caprolactam and hexamethylene diisocyanate.

BRISTLES

The first commercial use to which nylon was put was to replace hog bristles, formerly imported from China, in the manufacture of toothbrushes. So overwhelming has been nylon's victory in this field that nine out of ten toothbrushes are now bristled with this synthetic. Other types of brushes, such as hair and nail brushes, are being made more and more with nylon instead of the costlier natural bristles.

The shortage of war-essential paintbrushes put nylon in the spotlight in this field. Here a major problem developed: Hog bristles were superior because they tapered to a smaller diameter at the application end. This end, moreover was usually frayed, enabling the brush to hold more paint. Nylon bristles were tapered by forming the fiber during spinning, but chopping the bristle at the proper length required great precision: an error of 0.0001 inch in the setting of the cutting device would soon lead to a sizeable cumulative error and ruin the batch.

Although paintbrush bristles are also being made now from cellulose acetate and casein, by far the largest number is still being manufactured from nylon,



Nylon salt solution is shipped to yarn plants at Seaford, Del., and Martinsville, Va. First step is evaporation, followed by addition of pigment (above) to give yarn desired dullness.

PROPERTIES OF NYLON PLASTICS

Properties	*FM-1*	*FM-3*	*FM-101*	*FM-105*	*JM-6339*
Specific Gravity	1.14	1.09	1.12	1.08	1.13
Tensile Strength — 70, 77, 170°F psi	15,700, 10,530, 7,600	12,900, 7,600, 6,760	13,600, 9,480, 6,870	14,000, 8,900, 7,500	13,900, 4,050, 3,860
Modulus of Elasticity 77°F psi	325,000			1.9×10^5	
Stiffness 77°F psi	290,000	152,000	70,500	89,000	14,200
Impact, IZOD —70, 77, 170°F Ft.-Lbs/In.	.42, 0.94, .97	.27, 1.34,—(1)	0.29,—(2)—(2)	1.3, 1.8, 16.	0.55,—(2)—(2)
Rockwell	M90	M54	R107	R107	R38
Yield Temperature °F	320° (4)	320 (3)		220	
Methods of Working	Inj.	Inj., Extr.	Compr., Calendering, Extr., Solution	Injection molding, Extrusion	Compression, Solution
Not Resistant to	Phenol, Formic Acid, Conc. Mineral Acids	Phenols, Formic Acids, Conc. Mineral Acids	Alcohols, Methylene Chloride, Trichlorethane, Triclorethylene, Phenols, Formic Acids, Acids	Alcohols, phenols, Formic Acid, Conc. Mineral Acids	Phenols, Formic Acid, Conc. Mineral Acids, Alcohols
Outstanding for	High temperature resistance toughness	Chemical resistance, water resistance	Gasoline resistance, workability	Resistance to heat embrittlement	Wear resistance, pliability, low brittleness temp., resistance to aircraft lubricating oils
Major Uses	Heat resistant injection molded parts	Wire covering, injection (experimental)	Tubing, sheeting, wire covering, gasketing	Abrasion-resistant jacketing for electrical insulation	Proofing, fabric coating, gasketing materials

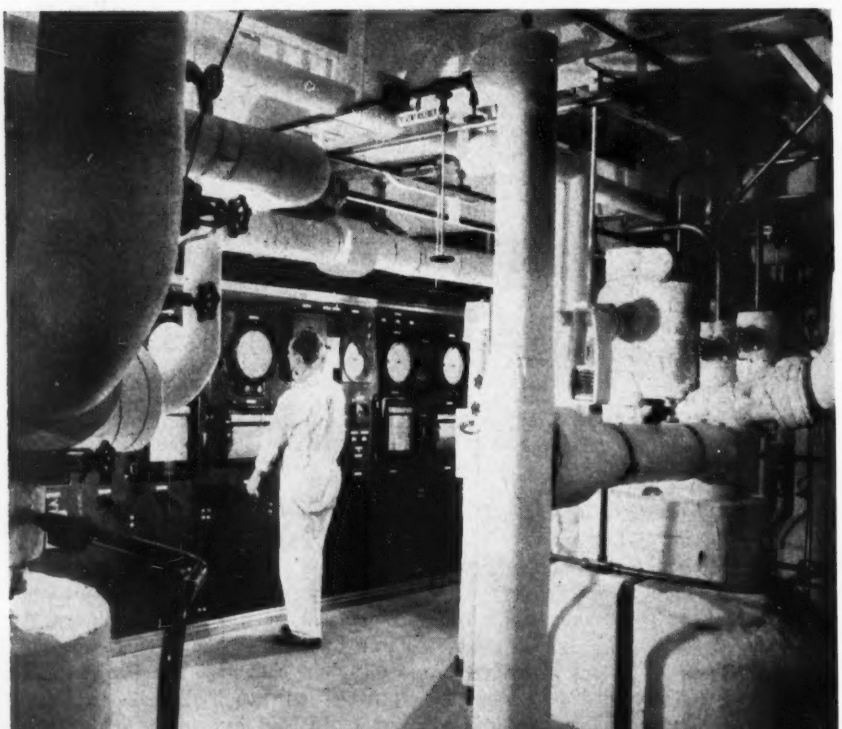
which beats the other synthetics and will outwear the natural bristle brush three to five times.

FIBERS

How thoroughly nylon has capture the hosiery market is best demonstrated by the course of silk hosiery prices since silk returned after the war. Starting from a price many times that of nylon, silk stocking have meandered downward until some time ago they were being advertised at prices below those of nylon.

Nylon is now looking at the markets presently held by wool and cotton Here, however, competition will not be so direct nor the effects so drastic as in the battle with silk. Because of its high cost nylon will probably find its most important role as a blending agent. For example: Crimped nylon staple is strong, abrasion-resistant, shrink- and mothproof, while wool is resilient, warm, and offers a fuller hand. A combination of these two gives a fabric which shrinks less upon laundering (dry cleaning is not required), wears better, and is more resistant to wrinkling.

Uncrimped nylon staple combined with cotton will go into long-wearing "cotton" fabrics for dresses, shirts, sheets and the like.



Nylon salt undergoes polymerization to the polyamide in these autoclaves. Operator is watching control panel, where lights, bells and recorders guard all stages of the operation.

Tests have been made on fabrics made entirely of nylon staple and on blends with other fibers. Rug and worsted yarns have been made experimentally, and knit goods have been fabricated with the new fiber.

The use of nylon staple is expected to require new procedures in fabric finishing. It is understood that certain problems have been encountered experimentally in carding and spinning, and in dyeing of the fabrics. The solution of these problems may involve modifications in textile machinery, the use of materials for dissipating static electricity, and the development of new dyestuffs and new dyeing techniques.

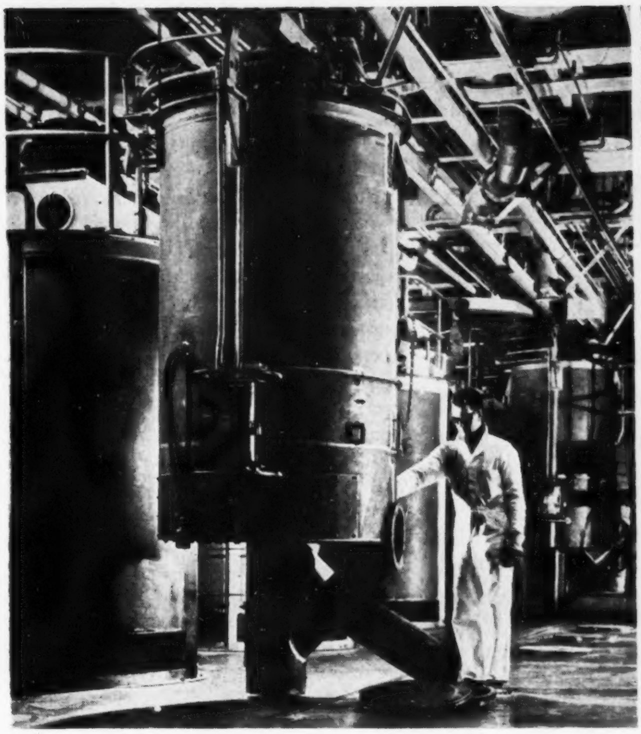
The new staple fiber will sell for about \$1.50-\$1.75 per lb. as compared with somewhat over \$1 per lb. for wool. Ten filament 30 denier hosiery nylon is now \$2.55 per lb. considerably lower than its introductory price of \$4.27.

The first nylon salt plant was constructed at Belle, W. Va., and the first spinning plant at Seaford, Del. Late this year additional yarn facilities will be added to the existing ones at Martinsville, Va., utilizing nylon salt from the new facilities at Orange, Tex., which began operation a short time ago. Construction of an additional yarn plant at Chattanooga, Tenn., and a new plastics plant at Parkersburg, W. Va. Corresponding facilities for more nylon salt capacity at various points, has been started. The Chattanooga plant is not expected to start operating until the summer of 1948. At that time, total yarn capacity will be about three times that reached at war's end, when sufficient nylon yarn was shipped to make 30,000,000 pairs of hosiery per month.

PLASTICS

Many of the same properties that make nylon a superior fabric are put to good use in an entirely different application: plastics.

Nylon for plastics is made up of various interpolymers of hexamethylene diamine, adipic acid, sebacic acid and caprolactam. About half of the nylon plastic materials



Nylon polymer is extruded, air-dried and flaked. Portable blender (center), suspended from a track, feeds flakes into stationary blenders.

Nylon flake undergoes many operations before becoming finished yarn, which is here being wound on cones before inspection and shipment.

is the polyamide made from the first two constituents.

Major uses for nylon plastics so far developed depend on its materially superior properties, inasmuch as it is considerably more expensive than most other materials. High impact strength, one of its superior characteristics, enables it to be used for metal-working hammers, loom-pickers, and the like.

Its high fluidity upon melting especially fits it for injection molding of thin sections and elaborate designs. Such moldings are dimensionally stable at temperatures above 300° F. They are resistant, too, to alkalies and most solvents with the exception of formic acid, phenol and concentrated mineral acids.

Nylon plastics do not become brittle at temperatures as low as —50° F. For this reason it is used for example, in anemometer cups where its toughness makes it superior to steel in escaping denting by ice particles. Its horniness singles it out as a desirable material for valve seats, where its exibility insures a tight closure and its toughness insures long life. It is being used in contact with such materials as hydraulic fluids, aromatic solvents and high-pressure oxygen.

The non-crystalline interpolymers, which are not suitable for fiber production, can be used for injection molding at temperatures of 510-520° F.

TWELVE OF THEM

At present twelve different nylon plastics are available, enabling the fabricator to pick the right one for a specific job. The FM-1 (see table) nylon is the polymer produced from hexamethylene diamine and adipic acid; in the FM-3 sebacic acid is substituted for adipic. In the accompanying table are tabulated the properties of five of the twelve nylons, the other seven having intermediate properties.

Polyurethane plastics differ but slightly from FM-3 nylon in their properties, but their high cost and the toxicity of the monomers would seem to limit their usefulness.

A caprolactam-containing polymer showed such superior properties as a coating for blasting wire that DuPont's Explosives Department erected a plant to manufacture caprolactam to produce a nylon plastic its own use.

An elastomeric modification now being developed is an N-alkly nylon and is so stretchy that it can substitute for rubber in foundation garments.

BRIGHT FUTURE

As far as the future is concerned, the sky's the limit. Nylon is not one material; it's a whole family of polymers, the properties of which can be varied to give metal-working hammers or the sheerest glamor hosiery, industrial filter cloths or superior curtains. The hosiery market is assured, but at the same time it is almost saturated. The challenge of the future is in the arena with plastics, and as a "competitive ally" with cotton and wool in blends of superior fabrics. The goal of 60 or 70 million lbs. per year by the end of 1948 may be only the beginning.

Magnetic Technique for Catalysts

A new magnetic technique for designing more efficient catalysts to expedite chemical processes has been developed at Northwestern University.

The process has furnished information as to the actual architectural structure of the atoms within catalysts, leading to a better understanding of how they effect chemical reactions. Better catalysts have already been designed for some processes, and it is possible that there will be at least a partial answer to the old problem of "how does a catalyst work."

A sample of the catalyst to be tested is chilled in liquid nitrogen and then suspended by a thin quartz fiber between the poles of a powerful electromagnet. Under the influence of the magnet the catalyst turns slightly. Changing the angle at which the catalyst is suspended, the chemist performs the experiment several times, each time observing the amount of twist due to magnetic attraction.

The new technique is also proving useful in the study of high polymers, such as plastics and rubber. It enables chemists to tell to what extent certain groups of molecules are orderly arranged.

RAW MATERIALS Also Need RESEARCH

by RAYMOND B. LADOO, Consulting Engineer*
Newton, Massachusetts

FUNDAMENTAL AND APPLIED CHEMICAL RESEARCH is old and understandably well established, for thus are new products, processes and uses discovered. Market research, too, has sprung out of our economic system. But raw material investigation, the author believes, has been relatively neglected in favor of these and is crying out for scientific study.

MAJOR emphasis, always, has been put on research for new products, processes and applications. And after many years the importance of market research is finally being recognized: Companies are hiring market research specialists, industrial publications are carrying articles devoted to that phase of industry, and a national association has been formed for those engaged in that type of work in the chemical field.

But somehow little has been done to attack raw material problems. Too little attention is given to the present and potential sources of raw materials for those new products, processes and applications which are flowing continually from the laboratories.

Too often the research man has no knowledge of nor concern for the sources of the materials he needs. He assumes that they will be forthcoming, and he is usually right—but on occasion he can be far wrong.

ORGANIC SOURCES

Where the basic raw materials are agricultural products, there may be no supply problem. Crops can always be grown, year after year. Even here, however, economic availability may be a question. Utilization of farm wastes, such as corn stalks, have repeatedly had to face up to such problems as collection and transportation to central points, seasonal supply, storage and crop failures. Those who would utilize wood waste, for example, must be sure that substantial tonnages are now available at strategic locations and will continue to be available into the indefinite future.

Waste products may sometimes reflect only a purely local or temporary condition. Waste products from fisheries, for example, being dependent on fish supply, may be seriously curtailed by over-fishing, stream pollution, and other factors which may reduce the catch. Fishing customs, state and federal laws and other considerations may determine whether wastes will be brought to shore or discarded at sea.

Where petroleum or coal are the base sources, there is little danger provided one is willing to go back to the primary raw material. There is danger, however, if the process depends on an intermediate obtained in petroleum refining or coal coking.

Because oil refineries must operate to obtain maximum over-all value for their products, processes change rapidly. Intermediates which are abundant today may become scarce and expensive when processes are changed.

METALS AND MINERALS

More caution must be exercised when a metal or non-metallic mineral is the basic material. The U. S. has so long been a "have" rather than a "have-not" nation that most of us still assume that our reserves of practically all minerals and ores are inexhaustible. The war, of course, helped to dispel some of these fond notions, and we learned that crystal quartz (for radio oscillators) and high-grade mica (for capacitors) are scarce all over the world.

Mica and quartz, digressing for a moment, are excellent examples of what raw material research might accomplish. They are needed for their physical properties rather than their chemical composition, and research may well uncover other natural or synthetic materials with the essential properties. The Germans made excellent high-tension capacitors from synthetic mica and mica substitutes.

Tin, too, is scarce throughout the world, and our present shortage should not be laid entirely to the fact that Japan was occupying our supply areas. Unless new deposits are discovered it will become even scarcer, and any chemical company should think twice before planning any large-scale use of tin chemicals.

Beryllium has so intrigued researchers that a tremendous amount of work has been done on the metal itself, its alloys and compounds; yet its world-wide supply is limited. Uses developed during the war, if carried to their limit, would call for an annual output far surpassing total world reserves in known deposits.

FEW BERYL DEPOSITS

Exhaustive exploration of all parts of the world not occupied by our enemies was undertaken in order to discover and develop additional beryllium ores, but results were disappointing. Total tonnages we can mine domestically or import from abroad are far too small to enable development of many promising applications.

Beryl, the only practicable beryllium ore, is unlike many other minerals in that it never exists in a solid vein. Rather, it is irregularly and sparsely distributed in a matrix of quartz, feldspar, mica and other pegmatite minerals. A "large" deposit is one which might yield 1000 tons of beryl as a result of mining 50,000 to 500,000 tons of rock. Pegmatite deposits, in which beryl is exclusively found, are easily recognizable and have been quite thoroughly explored throughout the world. New deposits may be found from time to time, but the hope of uncovering large reserves is dim.

Beryllium is a small-scale, expensive-use material which most likely will have

THE AUTHOR

Raymond Bardeen Ladoo knows whereof he speaks, for he has been concerned with raw materials throughout his professional career. Graduated from Harvard Mining School in 1916, he has been mine manager for John B. Guernsey & Co., mineral technologist with the U. S. Bureau of Mines, general manager of Southern Minerals Corp., president of Colorado Fluorspar Co., and engineer and manager of the industrial commodity department of U. S. Gypsum Co. Since 1932 he has been a consulting engineer in Newton, Mass. He is the author of several monographs on minerals and the mineral industries, and he serves the U. S. Bureau of Foreign and Domestic Commerce in an advisory capacity.

to remain in that class. It may be a key material for some uses, and such important applications should be catalogued and the material reserved for them. In the meantime—unless we discover unexpected sources—development of large-scale uses would appear to be a waste of effort.

Except for the joy of scientific achievement, there doesn't seem to be much reward for some investigations: One could grow bananas under glass in the New York Botanical Gardens, but expenditure of research dollars by a company, looking forward to the establishment of a banana plantation in New York, would hardly be justified!

CORRELATION NEEDED

The above examples are indicative of the obstacles which raw material shortages can put in the path of technological advancement. In the aggregate, a great deal of work is being done by those who are aware of the problem, but little concern has been felt for bringing together and correlating existing data, or even defining the problem and its ramifications.

It is much the same as market research before concerted efforts were made to systematize it. Much of the market analyst's work involves finding existing sources of information, gathering, recasting and interpreting it, and then applying it to his own problem. Gaps in data may be found and some original fact-finding may be necessary, but in general the bulk of the data is extant. A similar situation obtains in raw material surveys.

Suppose that the John Smith Co., as a result of a market analysis, contemplates building a branch plant in a new and distant location. It is a process industry which requires large quantities of various raw materials. Someone has to find out where these materials can be got in adequate volume, of proper quality and at permissible cost.

WHO CAN HELP?

The job is often left to the purchasing agent or the research department—men who are inexperienced in that kind of work and probably unfamiliar with that section of the country. Where should they go for information? Who understands their problem? They may do their best, but often neither they nor their employer knows how good or poor a job has been done before it is too late.

Local chambers of commerce, industrial departments of railroads, banks and utilities, state bureaus of mines, geological surveys and agricultural departments are all potential sources of information. They may be very good, mediocre or poor. In any case they are circumscribed by city, county or state boundaries and usually have an "ax to grind" for local products. But developed sources of raw materials will be known.

Perhaps a vital material is lacking and freight from the nearest known source is very high. What can be done? Here is where research steps into the picture. A sound grasp of needs combined with a detailed knowledge of materials available in a general area (not a single city or state) may provide a clue. Perhaps the solution will involve the use of a new or unconventional raw material.

Here, unfortunately, one bumps up against the rigor mortis of production departments. Some years ago the author was seeking information on paper filler and coating specifications. He visited research and production officials of most of the paper companies from Maine to Minnesota trying to find out just what was wanted in a paper filler. What are the physical and chemical properties, grain size and shape, adsorption characteristics, hardness, etc., of an ideal filler? How are these properties judged or tested? Most chemists hadn't the faintest ideas; they simply specified "So-and-So's Clay No. 15 or its equal" and let it go at that.

Courtesy American Potash & Chemical Corp.

"Too little attention is given to the present and potential sources of raw materials . . ."

ADVENTUROUS SPIRIT

At that time very few raw material producers knew anything about the use technology of their products; they simply produced clay, or talc, or whiting. Their customers, on the other hand, shopped around for the best combination of price and quality. Tailoring a raw product to fit a specific use was no one's business: it fell between two stools. Talc was talc, clay was clay, silica was silica. Chemically treated minerals were unheard of, and most users failed to realize that even natural products varied widely in physical and chemical properties.

War shortages and special needs changed a lot of that, but even today some of our larger companies are reluctant to consider strange and unconventional raw materials. Others, who haven't been afraid to try imagination and daring, have found that it pays.

AN OREGON VENTURE

An unusual — probably unique — approach to some of these problems is being initiated by Raw Materials Survey, Inc., of Portland, Oregon. This is a non-profit organization founded and supported by chambers of commerce, public utilities, banks, steamship companies, railroads, etc., of Oregon and southern Washington.

It is designed to offer factual engineering and economic data on raw material sources needed for present and potential industries of that area. It plans to show industries where they can get adequate supplies at permissible costs. No emphasis is placed on geographical origin and no effort is made primarily to "boost" local materials. If local materials are adequate in every respect, they are of course suggested, but of equal interest may be sources in Alaska, the Philippines, Texas or Mexico—anywhere that promises economical sources of desirable materials.

An experimental beginning was made in 1946, sponsored by the Industries Department of the Portland Chamber of Commerce. Its enthusiastic reception prompted organization on a larger and permanent scale. It is an experiment in research techniques and motives that bears watching.

JOB EVALUATION

Solves Many Wage Rate Problems

EDITORIAL STAFF REPORT

WAGE RATES, always a problem, are especially difficult to set in the chemical industry where so many jobs are peculiar to a single plant. Job evaluation is finding growing use in chemical plants because it provides a rational basis for pay on both usual and unusual jobs.

MODERN industrial engineering has done much toward systematizing the handling of wages and salaries A major phase of this work is job evaluation —a means for putting wages on a rational basis. The system is widely used in the fabrication and assembly industries, and during the last few years several large chemical firms have adopted it.

During the war there were outstanding cases of new process plants which had their wage scales set, jobs defined and employment requirements determined even before construction was completed. Job evaluation played a leading role in specifying the requirements for each job and the pay that it justied. Once established, job evaluation provides a valuable tool for management in setting rates, advancing men, hiring new help, and explaining the wage scale. To the employees it may be a guide to advancement and a gage of achievement.

Job evaluation should really be taken in two parts: evaluation and classification. Evaluation rates jobs as to the nature of the work required. Job classification relates the evaluation ratings to the wage scale in a regular series of graduated steps. Together they comprise a process for determining the differences between jobs. They insure the equitable payment of each employee on the basis of the nature of the work performed.

Job evaluation is not the answer to all wage questions. It does not set any standards as to the amount of work to be done on a job. It does not provide any incentive for the performance of more work. It just rates the jobs as they exist as to skill, mental effort, responsibility, physical application, working conditions, etc., and relates the total effect of these factors to a pay scale.

THREE WAYS TO DO IT

There are three general systems used in making job evaluations: ranking, factor comparison, and the point system. Each is more or less a refinement over the preceding one. The first and simplest is the ranking method. It is merely on overall judgment rating of all the jobs in a plant or process area without any attempt at subdivision into elements. It is probably useful where the number and variety of jobs is small, but it is not likely to be adequate for more complex plants.

The factor comparison system makes a breakdown of all jobs into a number of different elements or factors such as dexterity, mechanical ability, mental effort, initiative, responsibility, physical application, working conditions, etc. Individual jobs are ranked according to each of these factors. The number of factors employed varies with the range of jobs covered and with the preferences of the evaluator. Some systems use only four or five factors: some as many as 18 or 20.

Too few factors make it difficult to cover the full range of jobs and involves the risk that some vital elements may be slighted. The large number of factors tends to narrow the area of judgment and compensate errors in valuation. Increasing the number of factors improves the accuracy of the system, but also makes it more burdensome and harder to explain or "sell" to the employees. Many experienced evaluators feel that the use of 10 factors represents a good compromise.

The point system goes a step beyond the factor comparison method. It prescribes by concise definition or formula a series of degrees within each factor. It sets up a more or less absolute scale of values for each job element. It systematizes the processes which are mental in the factor comparison method, just as factor comparison systematizes the mental processes required in the ranking procedure.

Individual evaluators vary as to the number of degrees desirable in each factor—the usual range is four to eight.

Too few degrees limits the range of differences that may be reflected. But, too

many factors may involve some difficulty in making each degree sufficiently specific to be meaningful, and may engender considerable bickering from employees as to just what degree is justified for a job. Again there must be a compromise based on the accuracy desired and the precision obtainable.

The extent to which job evaluation men have analyzed and stipulated degrees within each job factor is often amazing to the uninitiated. It is a neat demonstration of what can be done by breaking a seemingly impossible problem down into "bit sized pieces." For an easy case such as education (when this factor is employed) the degrees are fairly obvious. They may run: ability to read, grammar school education, two years of high school, high school graduate, etc.

On the more abstract elements—e. g., initiative—one must resort to definitions for each degree. Initiative is a factor which indicates the extent to which a job requires independent action—the extent to which the employee is unable to go by orders and instructions. Here the definitions must reflect the differences in the type of instructions and the frequency and nature of independent decisions involved in the job. The range may be from simple verbal orders on every detail of the job to the reading of blueprints; from repetitive jobs where all decisions follow well established precedent to very difficult jobs requiring a high degree of independent action.

DEGREES MUST BE TANGIBLE

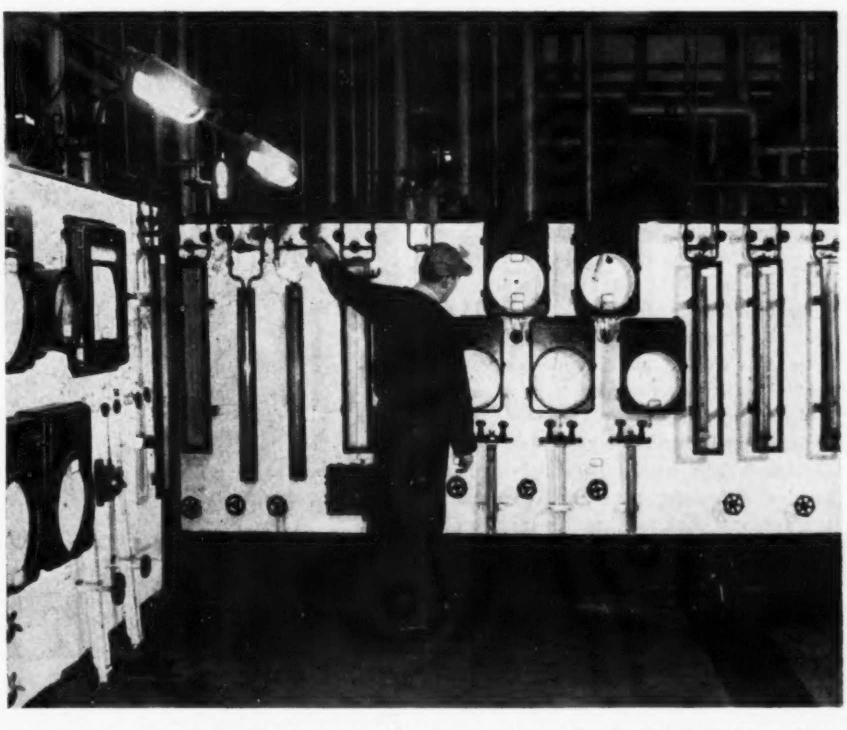
The definitions are highly important for everyone must have the same mental picture of just what is required at each degree. They demand positive statements of high objectivity. The failure of definitions in explicitness may encourage the tendency to rate jobs at the highest degree in a given factor.

Some consider the numerical values assigned to each dgree and the numerical total to be important. They point out two dangers. If the total value is large there may be quibbling as to whether a factor on a given job should be rated as 28 or 30 or 31, whereas a smaller total range of values—say 0 to 10—doesn't give any room for bickering. Second, they avoid as far as possible any similarity between the point values and the dollars and cents paid for the job, lest workmen assume that points are directly equivalent to money.

In well developed job evaluation systems the bases for points or degrees within each factor are worked out on the tangible aspects of the job that can readily be defined. For example mechanical ability is a function of the number and types of tools the worker must use, the nature of the work he must perform with them, and the number and kinds of adjustments he must make. Dexterity may be defined on the basis of the number and types of finger, wrist and forearm movements the job demands, and on the accuracy of movement required. Responsibility for materials and products is often determined on the extent to which the operator normally exercises control over the quality and quantity of production. In this case the normal variation in yield may be used as the gage—say the dollar value of one or two percent of yield loss. Similarly responsibility for tools and equipment is often gaged by the normal maintenance costs on the equipment use in the job. In both these responsibility cases evaluators avoid using the total value of material processed on the job or the total investment in the equipment as the yardstick. Unless they did this the night watchman might have the highest equipment responsibility on the plant and the man who loads the outgoing shipments might have the greatest material responsibility—both obviously absurd situations.

When job factors are properly weighted job evaluation will indicate lower pay for physical work — higher pay for mental effort.

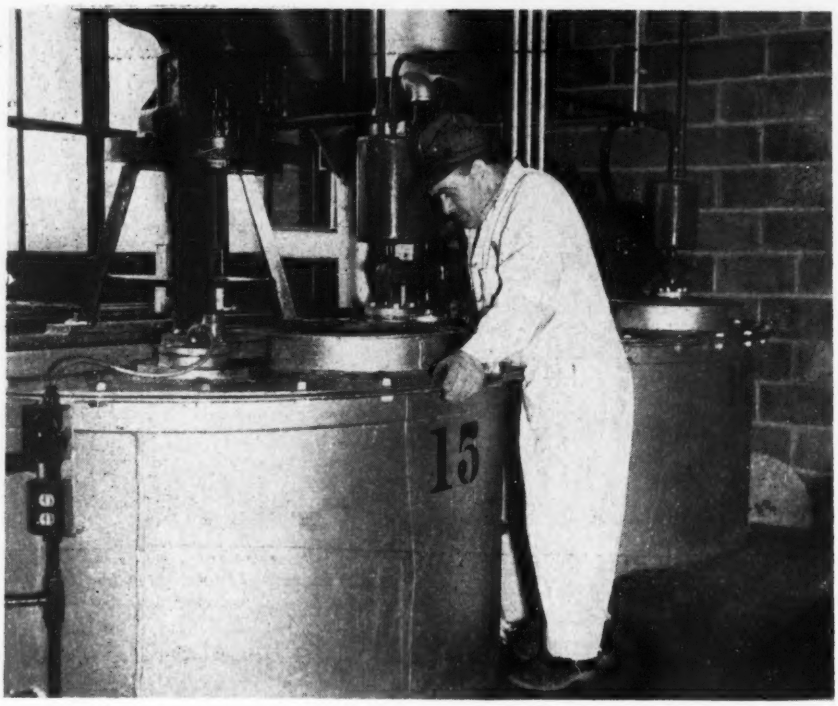
Other factors and their degrees are broken down and defined in a similar manner: Mental effort reflects the amount of organization and planning required, the number of machines and operations involved on the job, and the complexity of the interrelations between them. Working conditions are defined according to the exposure to heat, cold, dampness, darkness, glare, fumes, noise, vibration, etc. Physical application denotes weights a man must lift, the distance he must carry them, the frequency of lifting, and perhaps the abnormal positions he must assume. Exposure to hazards represents the possibilities, rather than the realities, in a job—the possibility of injury and the severity of injury, the possibility of occupational disease. In the latter factor actual accident rates on a job are sometimes employed as a yardstick, but in general this factor is intended to imply that there is a certain mental anxiety involved in a hazardous job, and to recognize that there should be some compensation for it in the pay check.



Important in many chemical jobs is the high degree of organization and planning required.

FACTORS HAVE WEIGHT

While the success of a job evaluation program depends on how well it analyzes the important job factors and on the accuracy with which it defines the degrees within each factor, still more important to its success is how well the final evaluations agree with wage differentials already established on the plant. Should the job evaluation system produce a com-



A superior initiative is required in making many vital decisions, often without precedent.

plete upheaval in the existing pay scale it would almost surely fail to find acceptance among the employees. Thus the evaluator is working toward a known answer to a large extent. In practice this means that the various factors must be weighted in a manner that will reflect the going values of skill, mental effort, responsibility, physical effort, initiative, working conditions, etc.

At first sight it may seem that the system is defeated before it starts if it must come out with a known answer. But actually it isn't that way. The going wage scales, particularly on the key jobs, usually represent the fundamental economy of supply and demand. Because the world has more people with "strong backs and weak minds," economic forces have placed a higher value on such factors as skill, initiative and mental effort than on factors such as physical application, working conditions and exposure to hazard. Thus it is necessary that the job evaluation system be geared to economic aspects of the wage scale by weighting each of the factors according to its established worth.

The process of determining factor weights is one of trial and error. It is done by selecting key jobs which are well known to everybody—jobs which cover the entire range of the pay scale. Each of 10 or 15 such key jobs is rated as to degree or points on each job factor. Then, taking one factor at a time, the jobs are listed in order according to their ratings on that factor. The jobs are also ranked in accordance with the pay received. By comparison of the individual jobs according to each factor and according to pay, the qualitative values of factor weights become apparent. A mechanical craftsman making $1.50 an hour may rank highest in mechanical ability and initiative. A workman in the yard gang making $0.70 an hour may have the highest rank in physical application and working conditions.

A further examination may show that the mechanic with the high pay ranks about equal to the janitor in exposure to hazard or physical application. By successive trials and comparisons weights are found which will adjust the value of the individual factors so as to result in a total evaluation on each job proportional to the wage scale.

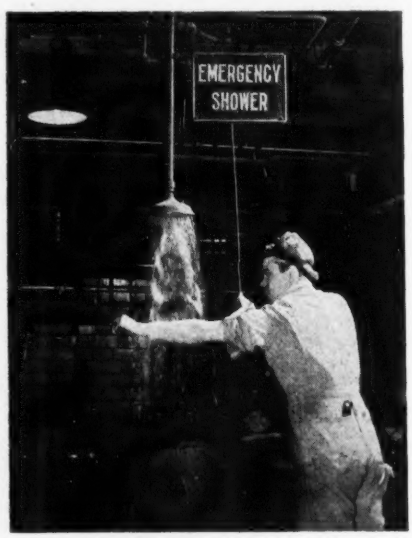
The weights that various factors receive may differ with the plant and the type of operation. A foundry, for instance, may have to rate working conditions higher than an assembly plant because the conditions are comparatively much more disagreeable. Some fairly general averages are: skill requirements (mechanical ability, dexterity, etc.), 40% of the total weight; mental requirement (initiative, responsibility, mental application, etc.), 35% of the total; working requirement (hazard, work conditions, etc.), 15%; and, the physical requirement, 10%. Figures for chemical plants will run considerably higher on the mental requirement and on work requirement, lower on skill and physical requirements. Most of the operating jobs in the chemical industry involve judgment, planning, understanding, responsibility, and hazards much more than they involve skill or physical strain. Perhaps 60% of the total requirement is for mental application and 20 or 25% for exposure to hazards or working conditions.

When the factor weights have been established, all jobs in the plant or processing area can be evaluated. A typical group of job evaluation points for a processing area is shown in Table 1. Some final adjustments may be necessary, to eliminate bad inequalities, but the system is now ready for the ultimate tie-in with the wage scale. The total points for each job are plotted against the wage paid for the job. The points should fall in a pattern roughly representing a line. Mathematical methods, such as that of least squares, are often employed in placing the final curve. Arbitrary adjustments to the mathematical curve may be necessary to hold the bottom and top wage levels within the desired limits.

JOB CLASSIFICATION

When a satisfactory curve is obtained the jobs can be classified. It is obviously impractical to work on the smooth mathematical curve, as there would be an infinite number of wage rates. Classification is essentially a process of breaking the smooth curve into finite steps representing levels of advancement. How many classifications to make is a matter of management decision. The general range is from three or four to 20 or more. Here again is a compromise: too few steps makes advancement slow and difficult; too many, make the individual advances small and insignificant. Ten job classification is considered to be a good compromise—it provides a definite progression of advancement through a prolonged series of steps, but keeps each step large enough to be worthwhile dollarwise.

The simplest method of classifying jobs is, of course, to divide the entire range into the desired number of equal parts. However, there are certain disadvantages to this method. The preferred procedure is to set up a geometric progression where equal percentage increases in job evaluation points brings an equal percentage increase in pay. This latter method has the advantage of making ad-



Job evaluation recognizes the need for extra compensation on jobs that expose the worker to unusual occupational hazards or diseases.

vances easier in the lower pay jobs and keeps the percentage raise uniform throughout the scale.

PREREQUISITES

There are at least three important prerequisites to the establishment of a job evaluation system: an experienced evaluator, a complete set of job descriptions, and a system of job standards. Much of the task in setting up a job evaluation system is just plain hard work, but considerable skill and experience is needed to avoid many pitfalls. The selection of job factors best suited to a given plant, the compromise on the number of degrees within the factors, the juggling to weight each factor, and the final classification of jobs all require foresight and judgment. Once the system goes into effect it is difficult to make major changes.

To insure uniformity all the data used in assigning job evaluation points is taken from carefully prepared job descriptions. Hence, the descriptions are a prerequisite. These are usually simple and brief, but the requirements are rather exacting. The description covers: the job title, the work performed — each specific duty and the percent of the time it takes, a list of the tools and equipment used, the physical surroundings, and the employee attributes required. Evaluators commonly utilize a standard form and a standardized style of writing—both geared to the job evaluation scheme. The job description must give enough detail to permit clear distinctions between jobs, but not so much as to create confusion as to what the actual differences are.

Specialized skills, so important in other industries, are usually of secondary weight in chemical process operating jobs.

TYPICAL JOB EVALUATIONS FOR CHEMICAL OPERATIONS

		Skill Requirement		Mental Requirement				Physical Requirement		Working Requirement	
Job Title	Total Points	Mechanical Ability	Dexterity	Mental Application	Initiative	Material Responsibility	Equipment Responsibility	Physical Application	Monotony	Working Conditions	Hazards
Reactor Operator	19	2	0	5	3	5	2	0	0	1	1
Filter-Dryer Operator	7	1	0	2	1	0	1	0	0	1	0
Still Operator	19	3	0	5	4	5	1	0	0	1	0
Packer Operator	6	0	1	0	1	1	0	2	1	0	0
Warehouseman	5	0	0	1	0	0	0	3	0	0	1
Furnace Operator	13	4	1	2	1	2	2	0	0	1	0

Figure 1. Samples of evaluation on typical jobs in a chemical processing plant.

Figure 2. Correlation between job evaluation points and wage rates sets base pay scale.

The job description should depict the job as it exists. If the job isn't being performed in the desired manner, changes should be made before it is evaluated. Job evaluation assumes that each job is "full" of work—that there is enough work to keep the employee busy. For this reason it is advisable that work standards be set before, rather than after, the job is classified. An evaluation made on a job without a full load of work may over-rate certain factors and cause difficulty later when it is desired to reduce the evaluation or put more work in at the same rating.

SYSTEM NEEDS MAINTENANCE

The completed and installed job evaluation system is not a static thing. It needs constant revision and maintenance. Jobs change—new features are added, or old ones are removed. Employees ask for revaluation—or management does. Revaluation is mandatory whenever tools or equipment change, whenever the process or work conditions are altered. And, since many small changes occur unnoticed, most well run systems are systematically rechecked every six months.

The properly devised and maintained job evaluation system is a valuable tool. It gives management a positive grasp of wage rates and a systematic method for controlling them. It is particularly useful in the chemical industry because it can set a just rate on a new job which is without any precedent—a frequently encountered case in chemical plants where many jobs are peculiar to a single plant or company. Likewise it takes emotional factors out of wage rate by giving the employee a concrete picture of just what he is being paid for. For both management and labor it focuses attention on the specific aptitudes and abilities required on each job.

CHEMICAL WEED KILLERS

Larger Crops, Less Work Augur Lush Market

by LAWRENCE SOUTHWICK
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NOT LONG AGO 2,4-D was a laboratory chemical, but this year output is heading for the five million pound level. Its commercial success has fostered more herbicide research, foreshadowing the development of many new chemicals and increased competition between both old and new products.

LITERALLY hundreds of chemicals and chemical combinations have long been used to kill and control weeds, but in recent years important developments have appeared with startling frequency. Some of the older proved materials, such as chlorates, arsenicals, boron compounds, and petroleum products, still enjoy wide, and in many cases, expanded usage. Of major significance, however, is the discovery of many new selective herbicides, such as 2,4-D and kindred chemicals.

As a result general interest in weed control is increasing — among chemical manufacturers, dealers in farm supplies, and most importantly, among farmers and other users. People are becoming "weed conscious" as new ideas and new chemicals show promise of effecting real and measurable progress in man's age-old battle against weeds.

Weed killers may be classified, in a rather general way, in three categories: selective herbicides, contact herbicides, and soil sterilants. The first two groups only will be considered here.

SELECTIVE HERBICIDES

When applied properly, selective herbicides or weed killers control certain species of plants without seriously injuring other species. They are utilized particularly to destroy undesirable weed plants in turf and on land growing various agricultural crops.

There are four types of selective weed killers based on the type of selective action involved.

CRESOLS

1. *Selectivity based on minimum wetting of the crop foliage and limited absorption of the weed killing agent through waxy leaf surfaces:*

Dilute sulfuric acid has been used in the past and is still used, but important newer synthetic organic chemicals in this group are certain dinitrophenolics. Sodium dinitro-o-cresolate, developed as a weed killer in France almost 15 years ago, was later formulated and distributed in the United States under the name Sinox for selective weed killing in certain field crops. Other related substituted phenols, such as ammonium dinitro-o-secondary butylphenate, have also been found to be selectively phytotoxic.

These materials, i.e. these salts of dinitrocresols and phenols, are similar in general properties and in their action on plants. At suitable concentrations they can be used quite successfully in selectively weeding small grains such as wheat, barley and oats; flax; peas; alfalfa, sweet clover and probably other clovers; onions, garlic, and chives, at least under some conditions; gladioli; and possibly other crop plants.

Some weeds such as mustard are killed outright under reasonably favorable conditions, i.e. when the weeds are small and in an active state of growth and when air temperatures are relatively high—above 65° F. Others may only be injured and stunted. However, this stunting may be just about as effective as killing since any further serious competition with the crop plants is usually prevented, particularly in drilled crops such as grains and flax. These weeds are reported to be controlled with dinitro sprays: chickweed, French (fan) weed, lamb's quarters, mustard (all species), pigweed (amaranthus), ragweed, shepherd's purse, wild lettuce, wild radish, marsh elder, tarweed, yellow star thistle, knotweed, wintercress, pineapple weed.

It is important to note that selectivity and effectiveness of these dinitro selective weed killers are influenced by certain factors such as air temperature for 24 hours following application. At cool temperatures (under 65° F.) reduced activity is compensated by increasing the spray concentration; under excessively high temperatures (above 85° F.) and humidity conditions, or if the crop plants are overly succulent, injury to crop as well as to weeds may result. Sprays should be applied only when the foliage of the crop plants is dry and under no conditions should wetting agents be used.

Tall weeds (left) are indigo. There was a complete kill in sprayed rice plot at right.

Of primary import is the fact that the younger the seedling weeds are at the time of treatment, the better will be the results from the use of dinitrophenolic selective weed killers. Crop plants may be burned slightly, and occasionally moderately, but recovery is usually complete with no apparent harmful effects on maturity or yield.

Nozzles giving a fan type spray pattern are recommended. A spray boom should be carried 15 to 20 inches above the top of the crop and the nozzles should be so spaced as to give a 50% overlap. Spray pressures of 40-100 lbs. are sufficient and 50 to 100 gallons of spray per acre should give uniform coverage. Chemical costs for dinitro selectives vary from about $1.25 to $3.00 per acre depending on the quantity used.

Products of this type are now used yearly on several thousands of acres of the crops mentioned. Yield increase due to spraying is dependent largely on the severity of the weed infestation. With

the development of the use of 2,4-D on grain (see below) there may be a trend away from dinitro selectives but only on grain not interplanted with legumes which are very sensitive to 2,4-D.

Calcium cyanamide in powdered form has been used as a selective weed killer on grain. The presence of dew at the time of application seems to be necessary for best results. Dilute sulfuric acid spray is still being used to some extent on onions.

Ammonium sulfamate, sold under the name of Ammate is a rather new weed control material. Although not usually considered to be selective, when used in dilute sprays (2-4 ounces per 100 gallons) it may be somewhat selective on some crops. This chemical is also a translocated weed killer (see 2,4-D discussion) and has been found particularly effective on poison ivy. It is usually mixed at the rate of ¾ to 1 pound per gallon of water for general spraying.

PETROLEUM FRACTIONS

2. *Selectivity based on the resistance of carrots and related plants to certain petroleum fractions:*

First, stove oil in the West and then Stoddard Solvent and other petroleum fractions in the East have been used extensively for selective spraying of carrots and in a more limited way of parsnips, parsley, and celery. Stoddard Solvent and similar cleaning and thinning products are sold under a variety of brand names such as Oleum spirits, Sovasol, Stanisol, Varsol, Sun Spirits, etc. They are naphtha-like products having fairly definite flash and final boiling points, an aromatic content around 10-15%, a relatively rapid evaporation rate, and an acute rather than a chronic toxic effect on plant tissue.

Spraying carrots and parsnips having 1-3 true leaves appears to be safe and is usually the best time with respect to weed size and susceptibility. Small weeds are easy to kill. Weeds usually wilt in 10 minutes to an hour after treatment and die within one or two days. Lamb's quarters, the pigweeds, most of the mustards, purslane, galensoga, and a number of annual grasses are readily killed. Ragweed is resistant. A common rate of application is 80 gallons per acre.

A large percentage of the commercial carrot acreage is being selectively weeded with these petroleum products. Savings over the hand method of weed control to the extent of $50 per acre have been reported.

COMMON SALT

3. *Selectivity based on differential plasmolysis (water extraction from plant cells)*:

Killing of susceptible plants is apparently due to actual withdrawal of water from leaf cells of sprayed plants. Red table beets, sugar beets, mangels and swiss chard have recently been reported to be resistant to concentrated salt sprays (200 pounds common salt ($NaCl$) in 100 gallons of water). Some weeds are also not affected significantly, for example, lamb's quarters and purslane. Weeds which are rather readily killed include pigweeds, ragweeds, smart weed, galensoga, and mustards. From 100 to 200 gallons of spray are used per acre and application is made after two true leaves have developed on the crop plants. This development is too new to warrant an accurate statement of its potentialities in the field of selective weed control.

2,4-D

4. *Selectivity based on resistance to the herbicidal action of growth regulating substances*:

The main agents falling in this category are: 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid, isopropyl carbanilate, and 4-chloro-2-methylphenoxyacetic acid.

At the present time, the most important of the active growth substances in weed control is 2,4-D, although there is reason to believe that other compounds may be found especially useful for specific weed-killing purposes. 2,4-D is selective in that most members of the grass family and certain other crop plants show physiological resistance to applications which are lethal to a wide variety of broad-leaved plants. Its action on susceptible species is not completely understood but it can be said that 2,4-D so upsets plant growth processes that death results.

2,4-D seems to be absorbed primarily through the cutin into the epidermal cells from which it, or its effect, is translocated to various parts of the plant. Translocation is predominantly downward although upward and lateral movements also occur. The failure of 2,4-D to kill all parts of extensively rooted herbaceous and woody perennials following a single application is probably explained by inadequate translocation. Experiments have shown that an application of 2,4-D induces rapid hydrolysis of starch to sugar and increased respiration. Killing of plant tissues is usually not a rapid process as it is with the contact type of chemical weed killer, the time often required for the killing process to be completed varying roughly from two weeks to two months. Rapidity of plant response varies with the air temperature, the plant specie involved, the rate at which the plant is growing when treated, and the particular 2,4-D formulation and concentration used. Under warm conditions, young, vigorous succulent plants will succumb quickly; treatment of plants which are

A heavy tonnage of weed killers is being used on agricultural crops, such as sugar cane.

Density of uncontrolled alligator weed growth in Louisiana sugar cane is shown at left. Virtually complete eradication of the troublsome weed is accomplished by spraying. (Right)

growing slowly as a result of poor growing conditions or advanced maturity usually results in a much more delayed response. However, the final killing action of the 2,4-D may be quite satisfactory.

The most efficient herbicidal action from 2,4-D application is obtained when plants are treated in a state of active vegetative growth. For annuals this means any time from emergence to flowering; for biennials, during their first year of growth, and prior to flowering in their second year; for herbaceous perennials, in the spring following development of new foliage but before flowering; for woody perennials, during the spring flush of vegetative development or whenever growth is active. Sprouts developing from cut stumps are often more effectively treated than are well-developed plants 3 or more years of age.

It is important to realize that flowering and seed production may be effectively inhibited by relatively light doses of 2,4-D. This is very useful in cases where complete plant kill is not required, for example in preventing pollen production on ragweed and other plants to curb hay fever epidemics.

2,4-D can also be absorbed by roots. In fact, plant roots are more consistently sensitive than plant foliage. Even grass roots are sensitive to 2,4-D and members of the grass family can be killed by sufficient soil applications. In addition plant embryos are very sensitive and germinating seeds can be killed readily by low concentrations of 2,4-D in the soil. This fact has fostered much experimental work on the use of 2,4-D and other growth - regulating chemicals to control weeds in the seed bed and thus to lessen the need for subsequent soil cultivation.

The present and potential uses of 2,4-D as a selective weed control agent are legion. It is now used on lawns, golf fairways, parks, cemeteries, pastures, roadsides, ditch banks, fence rows, vacant lots, barnyards, right-of-way areas, and in many other places to kill many kinds of herbaceous and woody weeds without causing serious injury to various grass species. Further, its use is increasing as a selective weed killer on grain, rice, sugar cane, sorghum and certain other crops. Much remains to be learned and additional uses are being developed. It is not within the scope of this article, however, to delve into the newer and essentially untried fields where 2,4-D shows promise.

2,4-D SALTS

Since 2,4-D is not very soluble in water or oil, manufacturers have converted the parent compound into water-soluble salts and oil-soluble esters, to be applied in spray solutions and emulsions, or in dry dust formulations. Products available today as 2,4-D herbicides fall into four groups: (1) Powders (for sprays) containing crystalline salts (such as ammonium and sodium) or admixtures of 2,4-D with alkaline materials which react on adding to water to form soluble salts (2,4-D plus bicarbonate of soda to form sodium salt). (2) Water-soluble liquids containing alkanolamine salts such as the triethanolamine and diethanolamine salts (or mixtures). (3) Water-mixable liquids containing various esters of 2,4-D (such as methyl, ethyl, isopropyl, butyl or amyl) in solution in an oily liquid along with an emulsifying agent. (4) Dusts containing either a salt or an ester of 2,4-D.

Both the salts and the esters have a definite place in the weed control picture. As a very general rule, ester formulations are somewhat more effective than salt formulations on the basis of a given unit of 2,4-D, particularly on slow growing and waxy leaved plants and on woody species. The advantage that esters sometimes show is due largely to greater efficiency of absorption. Being oil and wax soluble, the esters are absorbed into the leaf wax without the aid of moisture and apparently pass quickly to the living plant cells.

There seem to be no consistent significant differences among the various salt formulations on kill of sensitive weed species such as dandelion, plantains, mustards, etc. The salts in spray formulations have been very satisfactory under average conditions for lawns, golf courses and other turf areas and for use on small grains, rice and sugar cane. There is somewhat less danger to crops and to desirable plants in turf areas from the use of salts than of esters.

HERBICIDE DUSTS

2,4-D dusts are enjoying greatly increased usage because under many conditions they are equally as effective as sprays and are easier to handle. Dusts can be applied rapidly either by ground or airplane equipment and there are no delays caused by filling tanks with water—and even drawing water for long distances in some areas. 2,4-D water-soluble salt dusts are being used extensively this year on rice and sugar cane. Ester dusts are more effective in areas where rainfall and dew formation are lacking for weeks at a time, such as in certain areas in the spring grain belt.

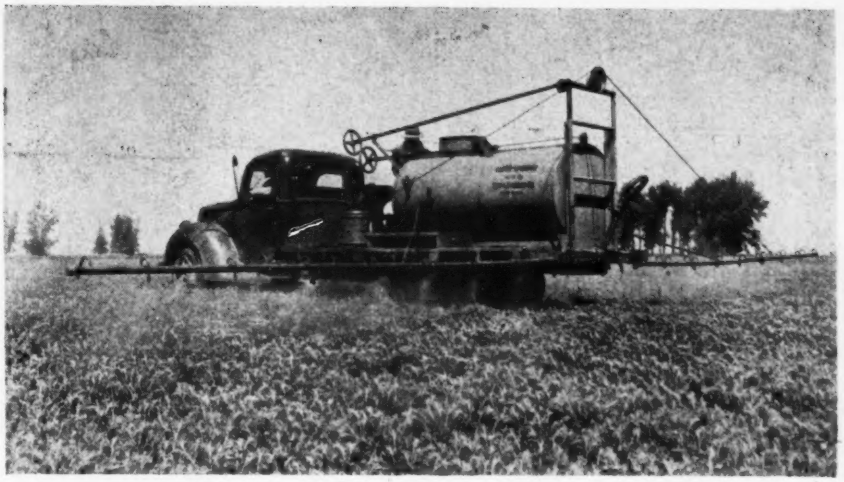
A warning should be given relative to the use of 2,4-D dusts. Drift to desirable sensitive plants must be avoided. Uniform application is essential. Water, and dry diluents are useful in bringing this about. However, it is the actual amount of 2,4-D applied per unit area that is the important consideration. Therefore the amount of diluent can be suited to the application equipment available. The trend is toward lower volumes and higher concentrations.

Certain cautions are in order. Keep 2,4-D off valuable or desirable plants. Do not apply 2,4-D to grain and rice at the young seedling stage or at heading time. Weed control with 2,4-D in corn, asparagus, strawberries, brambles, conifers and some other crops is promising but is suggested on the basis of experimental tests only until the situation is clarified. Use only sufficient 2,4-D to to the job—using more is wasteful, but, more important, may lead to difficulties. Avoid soaking the soil and control spray drift.

CONTACT HERBICIDES

These materials are non - selectively toxic to plant foliage and are not translocated throughout the plant. With a quick burning effect, small annuals and other seedlings are killed with a single treatment but established perennials regrow from the crown, root or underground stems and are killed only by repeated applications. The term, chemical mowing, has been applied to the use of

Thousands of acres of Texas wasteland, infested with plaguesome Cherokee Rose, have been reclaimed by use of 2,4-D. Cost was much lower than by mechanical clearing.



Typical spray rig applying a selective weed killer to flax in the Red River Valley district of North Dakota. Newer herbicides are now being used on a wide range of field crops.

contact sprays. The newcomers in this field consist of certain phenol derivatives applied in oil emulsions. Among the most phytotoxic compounds used today are dinitro-o-secondary-butylphenol and the closely related amyl form of the same series. These materials are designated as phenolic contact herbicides. It is interesting to note that the dinitro selective weed killers described earlier are the water soluble salts of the same or related compounds. Since the parent materials as used in contact sprays are not water soluble, they are formulated with emulsifiers and oil. These products are marketed in concentrated forms as Sinox General and Dow General Weed Killers. Two to three pints of the concentrate together with two to twenty gallons of diesel or other oil are made up with water to 100 gallons of spray.

In general, the lower amounts of oil are used when broad leafed weeds or potato vines are the major problem. For grasses, more oil may give improved results. The oil in these mixtures has some killing effect in itself (oils are sometimes used alone as contact weed control agents) but serves chiefly as a wetting and penetrating agent. Another weed killer formulation wherein the requisite amount of oil plus certain penetrating agents are supplied with the active dinitro ingredients is also available. For general contact weed killing, 3 gallons are used in 100 gallons of spray. Other special formulations are available as potato vine-killing sprays.

Best results are obtained when air temperatures at the time of application are relatively high. The use of aluminum sulfate as an "activator" at the rate of 2 pounds per 100 gallons of spray has given improved and quicker kill in many instances, particularly in potato vine-killing. High alkalinity reduces the efficiency of phenolic sprays and hence any lime residues in a spray tank should be neutralized prior to use for contact weed killing.

There are several specific uses for contact herbicides although the major one is chemical mowing of established vegetation. Applied in sufficient volume at recommended concentration, seedling plants are killed and the top growth of many perennial plants is killed to the ground line. Recovery from the roots is to be expected and repeat applications are required for effective control of vegetative growth particularly in humid areas. Considerable use is being made of contact herbicides on irrigation and drainage ditch banks, along highway cuts, in industrial plant areas, in waste areas and in orchards.

PRE-EMERGENCE SPRAYS

Pre-emergence chemical treatment of crop land is a new development. Weeds are very small and tender at the time pre-emergence spraying must be done—that is just prior to the emergence above ground of the crop plants. This type of weed control is most practical with crops that emerge slowly so that the weeds only will be hit by the spray. With plants having a protected growing point such as corn, onions and various bulb crops there is relatively little danger in the use of pre-emergence sprays since only minor injury will result, even if an occasional plant is breaking the surface at the time of application. On the other hand, extremely careful timing is essential where dicotyledonous plants such as beets, beans, tomatoes and many others are concerned. With these plants the hypocotyl emerges first, is not very noticeable and is very sensitive to contact spray materials.

Pre-emergence sprays can be used to excellent advantage when warm weather crops are seeded in cool soil. Many weed seeds will germinate and emerge considerably ahead of the crop seeds and can be controlled with a contact spray application. Very good results have been obtained on the following crops: onions, corn, potatoes, gladiolus, tulips, parsnips and carrots. Trials on other crops are underway. The phenolic contact sprays have given excellent results when used in relatively low dilutions. For example, the equivalent of one-half pound per acre of dinitro-o-sec.-butylphenol applied in as little as 50 gallons of water per acre has resulted in good weed control.

MAJOR USES

Contact herbicides can be utilized to advantage in treating alfalfa on the West coast for the control of annual and winter weeds, the spray being applied following a winter cutting when the weeds are small and the alfalfa is growing slowly. This method shows some promise for controlling winter cress and other winter annuals which are pests in north-central sections.

Weed growth around shrubbery and in nurseries can be controlled by proper use of contact sprays. Low pressure application using fan nozzles gives best results.

Potato vine killing with phenolic contact sprays containing dinitro-o-sec.-butylphenol in oil is now extensively used. The standard recommendation is to use 2 gallons of concentrate and 2 pounds of aluminum sulfate as an activator per 100 gallons of spray although varietal differences and other factors may necessitate variations from this standard schedule. Other phenolic formulations described earlier may be used. There is a very definite trend toward the increased use of potato vine-killing to check development of off-type and oversized tubers, to reduce the bulk of vines that clog mechanical diggers, to permit maximum ripening prior to digging and to check the spread of late blight and of certain virus troubles.

PROSPECTS

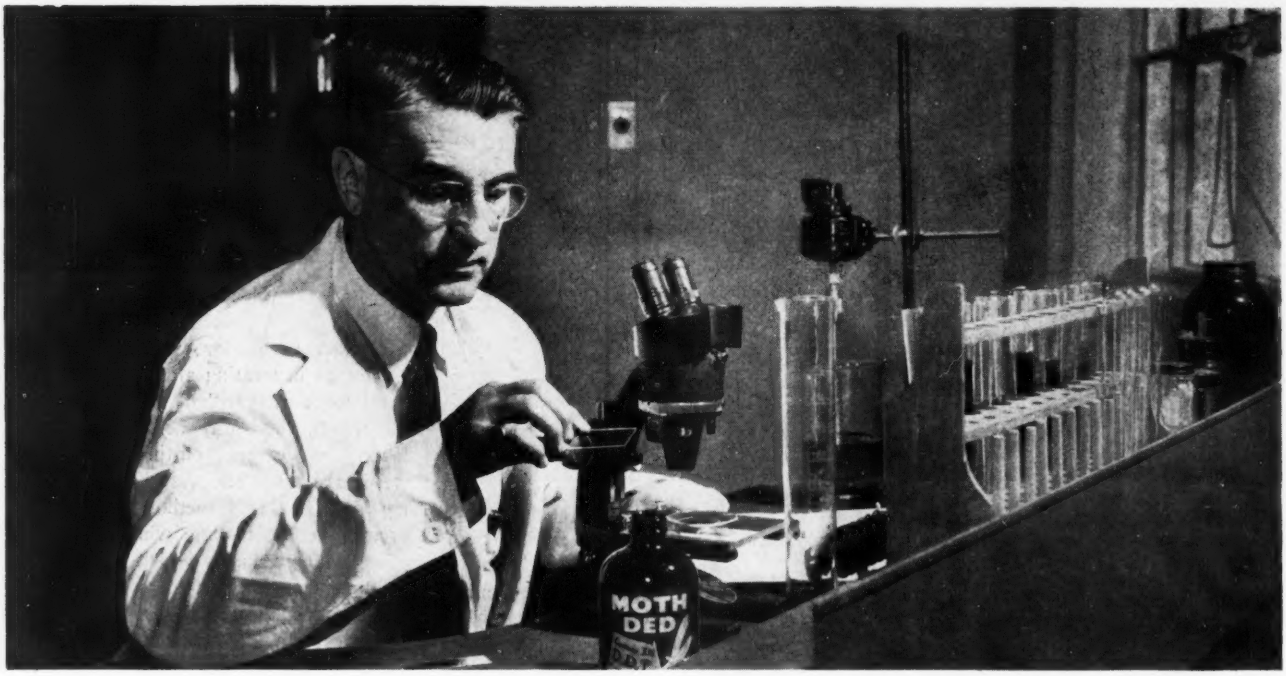
As has been indicated, the types of weeds and weed control problems are legion. But much has been learned of the fundamentals of plant processes and of the reactions by which chemicals curb growth.

A few years ago 2,4-D was a laboratory chemical; now it is a tonnage commodity. And herbicide research is progressing steadily.

Other promising herbicides are now being made in laboratory batches; some have advanced to field-testing. There is little doubt that many valuable new weed control agents will be developed and that the size of the potential market for weed control agents is tremendous.

Equally apparent is the dynamic character of the industry, a character which means constant progress and sharp competition.

Weed control agents face a promising and lively future.



New Chemical Weapons Spell Doom for Moths

by G. ALLEN MAIL
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IT STARTED WITH NAPHTHALENE, but now there are dozens of chemicals competing for a share of the rapidly growing mothproofing market. Not to be overlooked is the trend toward long-lasting mothproofers, the exploitation of which may well render obsolete many present formulations.

YEAR by year moths exact an annual toll of $200 to $500 million in damage to clothing, rugs, and upholstery in the United States alone. But, even though mothproofing products have been sold for years, it was not until comparatively recently that the industry really began to develop. Now it is a specialty business of substantial stature.

The last war, from two standpoints, did much to increase interest in mothproofing agents. In the research sense, a number of new chemicals were developed which proved to have merit as mothproofers; from the market viewpoint, the wartime need for clothing conservation served to introduce a larger segment of the public to household moth proofing specialties.

Both factors have contributed to the creation of a greatly expanded market. There is no questioning the fact that today mothproofing is big business.

There is no federal regulation which restricts or controls the use of the term "mothproofing" other than the rather broad provisions of the Federal Insecticide Act. A mothproofing agent, however, should be sufficiently permanent to ensure protection for a reasonable time, for example, during one season. In general, any product designed to protect wearing apparel or upholstery against moths (or carpet beetles) can be called a mothproofing agent if it satisfies the requirements of protection for one season. No distinction is made here between larvae of the clothes moth and the carpet beetle, sometimes called the buffalo moth. Much damage to fabrics attributed to the clothes moth is actually the work of carpet beetle larvae, which, having a much longer life cycle, often constitute a more troublesome pest. Official test methods for mothproofing call for the use of either clothes moth larvae or carpet beetle larvae.

THE IDEAL PRODUCT

The ideal mothproofing agent for use in the home should be such that treated garments can be subjected to several washings and dry cleanings and still be resistant to moths and carpet beetles. If the product is a spray it must not spot the garments or surfaces on which it is sprayed, or cause colors to run or change. If a volatile carrier is used for the toxic ingredient it should evaporate rapidly and be free from fire hazard. Obviously it should be highly toxic or repellent to all stages of the insect. Both sprays and fumigants must be free from health hazards.

Admittedly this is asking a lot of a mothproofing compound but some of the newer products being developed are approaching this ideal.

Mothproofing compounds perform their function either by acting as repellents, contact or stomach poisons. A lasting repellent is preferred as moths or moth larvae will avoid it. In the stomach poison type of mothproofing compound the larva must eat before it is killed, and even if it had to eat only a minute piece of the nap, in a sufficiently severe infestation considerable nap injury might result.

A few years ago a survey was conducted in five representative and widely scattered cities in the United States to sound out the sentiment on mothproofing. This survey revealed that more than 80 per cent of the individuals interviewed believed in the mothproofing of wearing apparel and practically all of this 80 per cent would be willing to pay substantially

more for mothproofed products. The reaction to the mothproofing of rugs was even more favorable.

These figures are borne out by the statement that one store alone sold an estimated $250,000 worth of moth products annually and that the total sales yearly by drug, hardware, department and chain stores approximate 25 million. These estimates do not include the large volume of moth products sold directly to industry, to woolen mills, dye plants for yarns, and fur and garment storage units.

The sales of mothproofing products used to be a seasonal proposition, but people now realize that in our present stage of civilization, with heated or air-conditioned dwellings, moths can breed and do damage throughout the year.

The best markets are, of course, in the more temperate zones, more cotton and fewer furs and woolens being worn in warmer sections of the country, which results, naturally, in a reduced demand for mothproofing agents.

PRESENT PRODUCTS

During the past two decades more than 1000 patents have been issued for mothproofing agents but relatively few of these actually have been marketed. Leaving out of consideration industrial users, mothproofing products fall into three general classes. These are sprays, liquid and solid fumigants, and compounds dissolved in organic solvents, usually dry cleaning agents.

Probably the largest number of mothproofing products now being sold are aqueous solutions of silicofluorides. Combinations of magnesium silicofluoride and ethanolamine silicofluoride are featured in two products, and two other popular specialties contain sodium aluminum fluosilicate and lithium fluosilicate respectively. Examples of fluosilicate type mothproofing compounds are Larvex, Hex, Guardex, Perma Moth and Ya-De.

Two widely distributed moth products which both give a guarantee of five years protection to treated fabrics, contain 1 per cent and 1.2 per cent sodium arsenite respectively, as the active ingredient. Quite apart from the demonstrated fact that their claims are open to doubt, the use of arsenic in mothproofing products is not recommended. The federal government is on record as stating that solutions containing arsenic in any form should be avoided and the American Medical Association considers the use of arsenic in mothproofing solutions unsafe.

The toxic ingredient is usually present in amounts ranging from 0.5 to 1 per cent in the solution prepared for use. When woolens are thoroughly impregnated with the proper solutions of these fluorine and arsenical compounds, their mothproofing value is unquestioned. But thorough impregnation does not mean just superficial spraying.

The disadvantages of such aqueous solutions are that washing removes the compound, they spot certain fabrics, and as they will freeze at slightly below 32° F., shipping and storage in winter months requires heated cars and warehouses. The fact that these substances are poisonous causes some authorities to doubt the advisability of using them on wearing apparel. On the other hand they resist dry cleaning and are stable to ultra violet light. Ultra violet light stability is important, of course, in the mothproofing of furniture which may be exposed to sunlight. Too, the stability of any mothproofing agent is an essential requisite for "permanent" protection of apparel, unless the garments are kept in constant storage.

Some manufacturers attempt to make use of the recognized value of paradichlorobenzene as a mothkiller by incorporating this chemical in a spray, using some solvent such as carbon tetrachloride with auxiliary solvents. Quite aside from the health hazard involved, and pronounced odor, it is doubtful if a sufficient concentration of PDB could be built up to protect a sprayed garment.

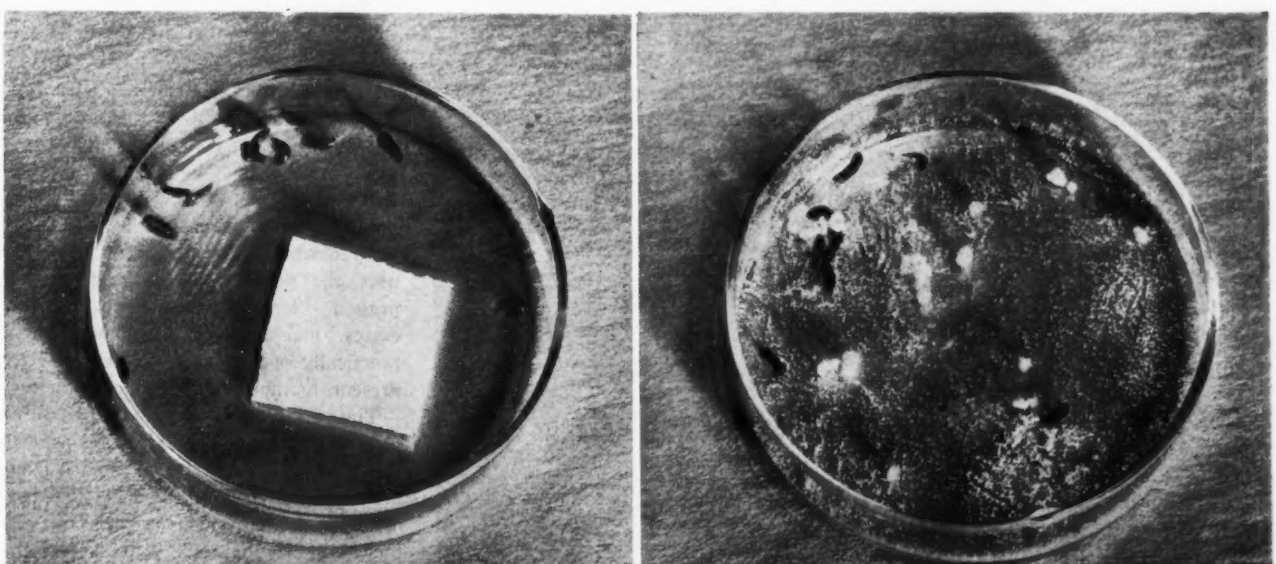
SOLID FUMIGANTS

Paradichlorobenzene and naphthalene are probably the best known and most widely used of the solid fumigants. These substances are effective only when the goods are stored in sealed containers or well packed in stout paper packages. Naphthalene is reputedly 10 to 14 times more toxic to insects than PDB but it is much less volatile. Both of these products do a splendid job of protecting woolens if properly used. One pound of crystals to 20 cubic feet in a tight container will kill all stages of the insects. PDB is preferred by many users because its odor is not so clinging as that of naphthalene. Recently there have appeared on the market certain polychlorinated organic compounds which it is claimed, can be used wherever paradichlorobenzene is indicated as a larvacide. They are said to be equally effective and last almost twice as long.

The blocks of solid fumigant designed to be hung in clothes closets are of little practical value. They deodorize and may have a slight repellent effect, but because closets usually are not tight and too little fumigant is used, they cannot protect clothing from moth injury. Their sales appeal is largely psychological.

Some products on the market are advertised as combined dry cleaning fluids and mothproofers. Such products, if effective, would be highly desirable, but in most cases the claims are exaggerated.

The closest approach to the ideal mothproofing process may be found in the



Carpet beetles did not attack DDT-treated wool in course of 28 day test. Right, they completely devoured ordinary wool in same period.

Courtesy Textile Research Institute

Larva in typical eating position. The head is lowered, and lower jaw pushed into the nap.

textile industry. So called "colorless dyes" of the Eulan type, developed in Germany, when added to a hot acid bath, are claimed to give permanent protection. One of these dyestuffs chemically is pentachloro-diphydroxy-triphenyl-methane-sulfonic acid, an organic compound with all the properties of a dye. Properly applied, this chemical will not be removed by either washing or dry cleaning nor deteriorated by exposure to light. Related compounds can be appiled from neutral baths and in organic solvents. The protection obtained against moth injury is lasting.

The application of mothproofing compounds by industrial users, if widely accepted, would greatly reduce the necessity for home treatment. It may not be too far in the future when all wearing apparel and upholstery will be sold with a mothproof guarantee.

RECENT DEVELOPMENTS

Several new synthetic insecticides have been developed during and since the war, some of which have been investigated for their mothproofing qualities. The most widely publicized of these is dichlorodiphenyl-trichloroethane, or DDT. While there is little reference in the literature to the use of DDT as a mothproofing agent, it nevertheless is an efficient mothproofer. So used, it functions as a contact insecticide and no nap feeding takes place. One of the largest manufacturers of insecticides in the country has a DDT mothproofing product on the market under the trade name of Moth Ded. DDT in itself has no "knockdown" properties and is not an ovicide. Combined with an efficient knockdown agent and ovicide for immediate destruction of moths and larvae, the DDT gives lasting protection.

Fabrics mothproofed with DDT are resistant to several washings but dry cleaning impairs its effectiveness and further treatment is necessary after dry cleaning. Incorporation of DDT in a dry cleaning fluid is the obvious answer. As a matter of fact one company has recently developed a process to prevent moth damage to clothes by impregnating them with DDT. The method involves a mixture of DDT—adsorbent powder and a pump percolator machine which dissolves the insecticide in the dry cleaning solvent. The machine sprays this solution on the clothes in the dry cleaner's extractor. This can be done in a dry cleaning establishment having the proper equipment, but it is out of the question for the home as DDT in organic solvents is highly toxic when it gets on the skin. DDT mothproofing solutions of the home spray type have the advantage over aqueous solutions of the silicofluoride type in that, having an oil base, the spray does not spot or stain fabrics.

Many homologues of DDT have been studied for insecticidal properties. Among them are 1,1-dichloro-2,2-bis (p-chlorophenyl) ethane (DDDT), 1-trichloro-2,2-bis (p-bromophenyl) ethane (Colorado 9), 1-trichloro-2,2-bis (p-fluorophenyl) ethane and di (methoxyphenyl) trichloroethane. Claims of equal insecticidal efficiency coupled with lower toxicity than DDT to mammals and plants make them of considerable potential value. However, some of these compounds are low in solubility and are readily thrown out of solution at low temperatures, while others are too costly to compete at present with DDT.

A chlorinated methyl naphthalene $C_{10}H_6Cl_8$ and a chlorinated terpene hydrocarbon $C_{10}H_{10}Cl_8$ are recently developed insecticides which have similar properties to DDT and one of which has considerable fumigant action.

Such of these new insecticides as have been tested for their mothproofing action were in no case superior to DDT and possessed the same shortcomings of being non-resistant to dry cleaning.

The new British insecticide, benzene hexachloride, now being manufactured in this country, has been stated to be highly toxic to clothes moths. In its present form, however, its pungent and lasting odor rules it out of consideration. This applies also to the pure gamma isomer.

PROSPECTS

Considerable time will elapse before mothproofing of fabrics at the mill will be routine procedure. Until this occurs there will continue to be a large demand for mothproofing compounds that can be used by the householder. However, it will probably not be long before a household mothproofing compound will be developed which will approach in effectiveness the permanency of protection at present offered only by industrial processes, and such a development will, practically overnight, render most of the present mothproofing agents obsolete.

The advent of plastic upholstery fabrics, most of them made of vinyl resins, will solve one of the most acute moth damage problems, in view of the fact that such materials are impervious to moths. Nevertheless it may be some years before the use of these newer materials will be extensive enough to markedly affect the market for mothproofing compounds.

Recently developed unit dissolves DDT (in bag at right) by percolation of dry cleaning solvent. Mothicide solution is then sprayed on clothes in the dry cleaner's extractor.

New CO-H_2 Converter Provides Better Temperature Control

EDITORIAL STAFF REPORT

CLOSE CONTROL OF REACTION TEMPERATURE in the newest CO-H_2 converter is achieved by a hydrocarbon vaporizing from the catalyst surface.

SUCCESSFUL operation of the Fischer-Tropsch reaction to produce hydrocarbons from carbon monoxide and hydrogen hinges on extremely close control of temperature. The reaction is highly exothermic and a temperature rise of as little as 5 or 10 degrees above the established optimum reduces the yield of desirable product in two ways: (1) by a sintering of the catalyst surface, which reduces catalyst activity, and (2) by increasing the yield of undesired methane and carbon dioxide.

This temperature control is achieved internally in a new type of reactor designed by the Bureau of Mines, instead of by means of heat exchangers alone, as carried out by the Germans, or by a fluidized fixed catalyst bed with a heat exchanger, as carried out in the proposed commercial installation in the United States.

In operation, a fraction of the liquid reaction product (b.p. 110-125°C.) is passed concurrently along with the synthesis gas through the 9′ x 3″ cylindrical column of pelleted catalyst at 100-150 psi. As heat is liberated by the reaction, vaporization of the injected liquid holds the temperature of the catalyst at the desired point, about 200°C. in the case of the cobalt-based catalysts. Temperature variations can be achieved either by a slight change in the pressure or by using a hydrocarbon fraction with a different boiling point.

GERMAN PRACTICE

The poor conditions for the removal of heat through the walls of the vessel in the usual fixed bed reactor, utilized in the conventional German process, led to the dictum of Franz Fischer that at no point in a reactor of this type should the catalyst be more than 5-7 mm. from a cooling surface.

Two different types of reactors had been evolved under the 5-7 mm. restriction by the time the plant design was "frozen" as a part of the German war program in 1938. For normal pressure operation (1 atmosphere), vertical plates were set in parallel 7.5 mm. apart. Horizontal tubes through the plates were used for circulation of the coolant (water), giving the equivalent of a fin tube heat exchanger with the catalyst bed around the tubes and between the plates. The end result is a 50-ton rectangular converter containing 10 cu. m. of catalyst and producing about 18 barrels per day of liquid hydrocarbon product.

The converter used for the medium pressure process (7-10 atmospheres) utilizes a tube within a tube; the catalyst being supported in the annular space between the tube walls which are 10 mm. apart. Two thousand of these double tube assemblies make a single converter holding 10 cu. m. of catalyst and producing about 18 barrels per day of liquid product.

The complexity of the equipment required for the German process is such that the investment is of the order of $7,500-8,000 per barrel of hydrocarbon product per day, compared to an estimated investment of $3,000–3,500 per barrel of hydrocarbon product per day for the American design using a fluidized catalyst. The American design requires less than one per cent of the heat exchange surface required by the German design. Plants using the American version are scheduled for installation by Carthage Hydrocol, Inc. at Brownsville, Texas and the Stanolind Oil and Gas Co. in the Hugoton field in Kansas.

AMERICAN PRACTICE

A fluidized fixed bed is utilized in the process to be installed in the United States for carbon monoxide hydrogenation. Here heat is removed from the catalyst by suspending the finely-ground catalyst in the reactor in such a manner that the gaseous reactants produce a "boiling" effect on their passage through the catalyst bed. This turbulence of the fluidized particles creates good conditions for the transfer of heat through the tubes of the heat exchanger which is an integral part of the reactor. The catalyst at all times remains in the reactor and does not circulate with the circulating reactants as in the case of the standard fluid catalytic cracking unit.

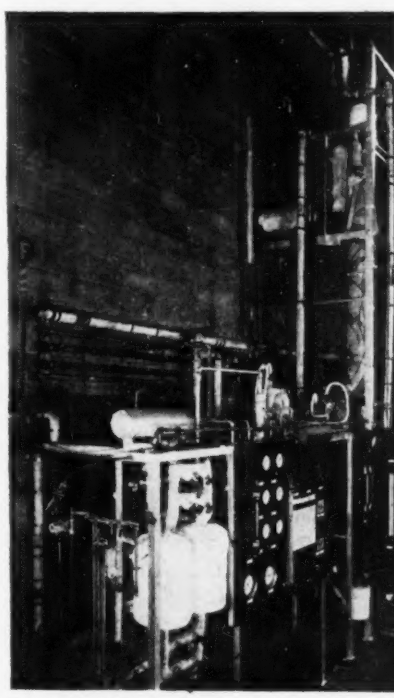
The catalyst used so far in the American units is a promoted iron oxide catalyst, similar to that used for ammonia synthesis from nitrogen-hydrogen mixtures. Reports indicate that the well-known tendency of iron-based catalysts to form a carbon deposit on the surface have caused considerable difficulty in the pilot plant operations for this process.

INTERNALLY COOLED UNIT

The year 1943 saw the initiation of studies by the Bureau of Mines for the internal removal of the heat of reaction by boiling liquid coolants. In early experiments liquid was allowed to trickle over the catalyst surface countercurrent to the flow of gas. So far, flooding problems have been encountered when countercurrent flow is used at high space velocities in the gallon-per-day unit which has been in intermittent operation for the past 18 months. Consequently parallel flow has been used when operating at the highest space-time yield, about 1000 pounds per cubic meter of catalyst per day. This is believed to be about half the space-time yield attainable with the fluidized units. Recycling and multi-stage operation are expected to give sizable increases in the attainable space-time yield.

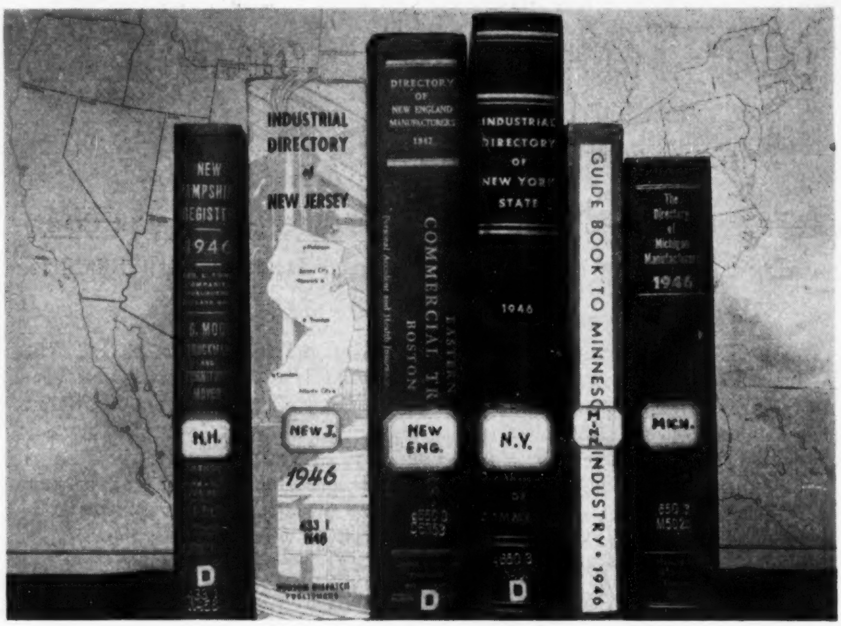
In 18 months of operation, one continuous run of over 600 hours has been made without appreciable loss in catalyst activity. Use of a hydrocarbon liquid in contact with the catalyst provides another important advantage: removal of the high-melting waxes that have always "blinded" the surface of the cobalt-based catalysts after a short period of operation.

It has been estimated that an internally cooled unit should cost about the same as the fluid catalyst unit per barrel of hydrocarbon product per day. In addition, it provides more flexible operation, requires no internal heat exchanger in the catalyst chamber, and is essentially automatic in its operation once controls have been set.



New CO-H_2 converter at the Bureau of Mines laboratories in Pittsburgh. The internally cooled columnar reactor may be seen at the right.

STATE GOVERNMENTS serve as the authors, compilers or editors of many publications indispensable for market research. Here an authority on sources of business information presents a complete index of state industrial directories.



State Publications for Market Research

Part I: INDUSTRIAL DIRECTORIES

by ROSE L. VORMELKER, Head, Business Information Bureau
Cleveland Public Library, Cleveland, Ohio

MOST state governments have a "Department of Commerce and Industry" or a "Resources and Development Commission" or some similar department which has the responsibility for compiling for its state that "sine qua non" tool of market research—the industrial directory.

Usually such directories are available for nominal sums—sometimes for a handling charge only, sometimes free of charge. Some states, however, either from lack of adequate funds or vision to understand the need, have not made proper provision for the assembling and publication of useful trade directory data. Other organizations, therefore, have attempted to fill in the gaps. In these instances the directory has been published commercially and sold for prices varying from $2.00 to $25.00. In other cases they have been compiled by commercial organizations or research bureaus and offered as a service for members or clients.

All these factors account for a great unevenness in the make-up and scope of the directories. Some are substantial volumes with detailed information giving more than one listing for firms (classified, alphabetical, geographical), number of employees, products manufactured and other data, while others are brief mimeographed lists with no statistical data other than names of firms and addresses. This situation is paralleled also in the publication of corporation directories for the various states.

The following list of state industrial directories is the result of a continuing survey begun last year. It is a revision of one published as the November, 1946, issue of "Business Information Sources," the official publication of the Business Information Bureau of the Cleveland Public Library. In addition to industrial directories for various states there are included several regional directories and regional classified buyers' guides issued by mailing list houses. An examination of the list will reveal the existence of a directory which, in turn, contains names of potential contacts for market researchers in every state of the Union and Alaska.

The list is arranged alphabetically by states, with regional directories, regional classified buyers' guides, and Alaska at the end. The arrangement of the data is as follows:

1. Exact title of the directory.
2. Exact name of state division or other organization which compiled or published it. This represents the source from whom it is available unless it is noted as "Out of Print," in which case it may be purchased (probably only) through second-hand dealers.
3. Date of the latest edition.
4. Price at which it is available from the publisher given under (2). In cases where no price was ascertainable an asterisk appears denoting a suggestion that price be obtained on application to the publisher.
5. A brief annotation which indicates the nature of the information included in the directory.

Market researchers will know that many—if not all—of these directories may be found in the business departments of some public libraries.

ALABAMA

Directory of Manufacturers. Alabama Industrial Development Board, Montgomery, Alabama. 1938. *
Arranged by manufacturers and products; by products of mining companies; and by geographical subdivisions. No later edition published to date.

Industrial Alabama. Alabama State Chamber of Commerce, Montgomery 1, Alabama. 1946. *
Contains five lists: 1. Alphabetical by industries with address and name of manufactured products; 2. Mining companies; 3. Newspapers; 4. Industries and mines by county; 5. Product.

* Price on application to the publisher.

ARIZONA

Business and Professional Directory of Arizona, 1941-1942. Arizona Directory Company, 619 East Van Buren Street, Phoenix, Arizona. 1941. $17.40.

Geographical and classified listings giving names of officers of corporations, managers or owners of businesses. Includes a section on wool growers and livestock growers and dealers.

ARKANSAS

Industrial Directory of Arkansas. Arkansas Resources and Development Commission, 104 State Capitol, Little Rock, Arkansas. 1946. 50c.

Arranged by county and by product. Gives number of employes.

CALIFORNIA

NOTE: The latest state directory of manufacturers was the "Mercantile Guide, the California Business Directory," 1931. Inquiries addressed to the State Department of Industrial Relations of California, to the California Development Association, and to the Los Angeles Chamber of Commerce all indicated that there is no later industrial directory covering the whole state and none scheduled at present (1946). There are excellent data for certain regions of the state. See also Regional Buyers' Guides noted at the end of this list.

COLORADO

Colorado State Business Directory. The Gazetteer Company, Inc., C. A. Johnson Building, 17 and Glenarm Streets, State 410, Denver Colorado. 1943. $25.00.

Businesses are listed geographically and by product.

CONNECTICUT (See also Regional List at end)

Directory of Connecticut Manufacturing and Mechanical Establishments, 1946. Connecticut—Department of Labor, Hartford Connecticut. *

Arranged by counties and towns. Gives products made and number of persons employed. Contains separate section for laundries and dry cleaning establishments.

DELAWARE

Manufacturing and Industrial Establishments of Delaware. Delaware—Labor Commission, 400 Equitable Building, Wilmington 7, Delaware. 1946. *

Manufacturers and their products arranged by counties and towns.

FLORIDA

Directory of Florida Manufacturers, 1943-44, with supplement for 1946. Florida State Chamber of Commerce, 510-516 Hildebrant Building, Jacksonville 2, Florida.*

Arranged geographically and by product.

Industrial Directory of Florida, 1935-36. The Record Company, St. Augustine, Florida. 1935. $15.00.

Arranged geographically and by product. Includes kind of business organization (manufacturers, wholesalers, dealers, etc.), names of officers, products made or handled, sales method used, capacity of production facilities, trade names and other useful data.

GEORGIA

Directory of Georgia Mineral Producers. Georgia —Department of Mines, Mining and Geology, Atlanta, Georgia. 1943. *

Arranged by product; e.g., asbestos, barite, bauxite, etc.

Industrial Directory. Georgia—Department of Labor, Atlanta 3, Georgia, 1940. *

New edition to be compiled in near future.

Manufacturers of Georgia. The Agricultural and Industrial Development Board of Georgia, 20 Ivy Street, S. E., Atlanta, Georgia. December 1945. *

A list of the manufacturing enterprises of Georgia grouped according to 23 classifications. Shows name of firm, city and county in which it is located, and where possible number of employes.

IDAHO

Idaho Industries. Idaho—Office of Secretary of State, Boise, Idaho. 1946. *

A classified list of agricultural processing and industrial establishments. Includes also list of mines and their products and manufacturers of wood products.

ILLINOIS

Industrial Directory of the State of Illinois. Illinois State Chamber of Commerce, 20 North Wacker Drive, Chicago 3, Illinois. 1940.

Arranged by city and by product. Number of employes indicated by symbols. At present no later edition is planned by the Chamber.

Manufacturers and Corporation Directory of the State of Illinois, 1947-48. Manufacturers and Corporation Publishing Company, 105 West Adams Street, Chicago 3, Illinois. $18.00 (This directory is in process of compilation now. It is planned for publication "about the middle" of 1947.)

Broadside says this will contain for each company included, a complete list of corporation officers, number of employes, capital invested, and products manufactured. Also included will be basic information on population of cities and towns, transportation facilities, financial institutions, leading hotels and airports.

Where to Buy—Where to Sell. Manufacturers' News, 624 South Michigan Avenue, Chicago, Illinois. 1941. $15.00.

A product index and an alphabetical index to Illinois manufacturers, listing officers and products, also date of establishment, number of employes and capitalization when known. New edition planned for late 1946 or early 1947.

INDIANA

The Indiana Industrial Directory. Indiana State Chamber of Commerce, Board of Trade Building, Indianapolis 4, Indiana. 1946. $10.00.

Contains a listing, by city, of all manufacturers, processors, and wholesalers, with person in charge, products handled, and approximate number of employes; a product classification section; and a state-wide index or locator.

IOWA

Directory of Manufacturing Establishments. Iowa—State Bureau of Labor, Des Moines, Iowa. 1941. *

Arranged geographically by city or town and also alphabetically by type of goods manufactured. Gives population and shipping facilities for each locality. New edition to be issued shortly.

List of Firms in Iowa Employing 50 or More Persons. Iowa—State Bureau of Labor, Des Moines, Iowa. 1941. *

Arranged under city in groups by number of employes: 500 or more, 250-500, 100-250, and 50-100. Gives exact number of employes and kind of business for each firm.

KANSAS

Kansas Buyers' Guide. Kansas—Industrial Development Commission, 801 Harrison Street, Topeka, Kansas. 1943. *

Arranged alphabetically by product manufacturers.

KENTUCKY

Kentucky, Industrial Directory. Kentucky — Department of Industrial Relations, Frankfort, Kentucky. 1943. *

Entered under county and town, with products manufactured and number of employes. A new edition is in process.

LOUISIANA

Industrial Directory, State of Louisiana. Louisiana—Department of Commerce and Industry, Baton Rouge 4, Louisiana.

Lists companies alphabetically, geographically (with statistical data for city or town) and by kind of product. Tentative plans for new edition in near future are in the making.

MAINE (See also Regional List at end)

Buyer's Directory of Main Industries and the Products They Make. Maine—Development Commission, Augusta, Maine, 1943-1944. *

Listed by firms and by products.

Maine Register, 1946-47. Fred L. Tower Companies, 795 Forest Avenue, Portland, Maine. $10.00.

Published annually. Arranged by county and city giving classified list of business and industrial organizations under each one. A classified list is given also for the state as a whole. (No data on firms given other than address.)

MARYLAND

Directory of Maryland Manufacturers. Maryland—Commissioner of Labor and Statistics, Baltimore, Maryland. 1940. $1.00.

Listings, under City of Baltimore and by county, are alphabetical by firm name, with products, industry code number, and number of employes.

MASSACHUSETTS (See also Regional List at end)

A List of Manufacturing Establishments Which Normally Employ 100 Wage Earners And Over. Massachusetts—Department of Labor and Industries—Division of Statistics. 1946. *

Alphabetically by cities and towns. Indicates products and number of wage earners.

MICHIGAN.

The Directory of Michigan Manufacturers, 1946. Michigan Manufacturer and Financial Record, Detroit 26, Michigan. $20.00.

Contains alphabetical, geographical and products sections. Gives addresses, products, executive personnel, number of employes, and date of establishment.

MINNESOTA

Guide Book of Minnesota Industry, 1946. Minnesota Resources Commission, 624 State Office Building, St. Paul 1, Minnesota. Gratis.

Classified by industry and by city, with industrial facts for each municipality, population, names and addresses of manufacturers, listing of products and an alphabetical index to industry classification. For each company are given: 1. Market legend: local, regional, national and export; 2. Employment legend: A. 1-10; B. 10-50; C. 50-500; and D. over 500.

Minnesota State Commercial Directory, 1937-1938. The Reavis Press, 412 Sixth Avenue, Minneapolis, Minnesota. 1937. $10.00 (boards); $7.50 (paper).

Arranged alphabetically by cities and towns. Reavis Press no longer listed in Minneapolis telephone directory and a letter addressed to the company was returned unclaimed so it is assumed book is Out of Print.

MISSISSIPPI

Index of Manufacturers in Mississippi. Mississippi Agricultural and Industrial Board, P.O. Box 849, Jackson 106, Mississippi. 1946. *

Classified by industries and counties.

MISSOURI

Industrial Directory of the State of Missouri. Missouri—Department of Labor and Industrial Inspection, Jefferson City. 1946. *

Firms listed by location and industrial classification with number of male and female employes.

MONTANA

Note: The Commissioner of Labor, of the State Department of Agriculture, Labor and Industry, Helena, Montana, reports, September 21, 1946: "We have no such publication, nor do we know of any office or agency having same". See Regional buyers' guides at end of list for possible Montana information elsewhere.

NEBRASKA

Note: The State Commissioner of Labor, Lincoln, Nebraska, reports, as of September 18, 1946: "This State does not publish an Industrial Directory. I do not know of any organization in this State publishing such a directory". See Regional buyers' guides at end of list for possible Nebraska information elsewhere.

NEVADA

Nevada Manufacturers and Processors listed by Counties; compiled by Reno Chamber of Commerce, Reno, Nevada. No date. (Received 1946) *

Alphabetically by firm name under county, with product manufactured indicated.

NEW HAMPSHIRE (See also Regional List at end)

Directory of Commercial and Manufacturing Establishments Employing 3 or More Persons. New Hampshire—Bureau of Labor, Concord, New Hampshire. 1941-42. Gratis.

"The next Biennial Report should be available for distribution early in 1947."

Made in New Hampshire. New Hampshire—Planning and Development Commission, Concord, New Hampshire. 1940. $1.00.

Three sections: (1) arranged alphabetically by company, (2) arranged geographically, and (3) arranged by product. Serial number identifies firm in products section.

New Hampshire Register, State Year Book and Legislative Manual. Fred L. Tower Companies, 795 Forest Avenue, Portland, Maine. 1946. $8.00.

Published annually. Arranged by city, giving names of business and industrial plants under each one. Contains also classified business directory, listing firms alphabetically under each business or industry.

NEW JERSEY

The Industrial Directory of New Jersey, 1946. Hudson Dispatch, Union City, New Jersey. $10.00.

Manufacturers listed alphabetically, with officers, products, and number of employes. Contains a geographical arrangement, with economic facts about counties and municipalities; a products section; and an index to municipalities. Gives many facts and statistics covering industrial and working conditions in New Jersey.

NEW MEXICO

New Mexico State Business Directory, 1942-43. The Gazetteer Publishing and Printing Company, Denver, Colorado. $20.00.

Arranged by locality. Gives names and product handled only.

NEW YORK

Industrial Directory of New York State. New York—Department of Commerce, Albany New York. 1946. $12.50.

Lists manufacturers and non-manufacturers, by up-state and New York areas, with number of employes, male and female, products made, and name of president or proprietor.

NORTH CAROLINA

Industrial Directory. North Carolina—State Department of Labor, Raleigh, North Carolina. 1944. $1.00.

Arranged by county and by industry. Indicates number of employes.

NORTH DAKOTA

NOTE: The Deputy Commissioner, Department of Agriculture and Labor, Bismarck, North Dakota. states as of September 25, 1946: "Our Department does not issue a business or industrial directory for the State of North

Dakota. I know of no agency at the present time which issues such a directory."

There was a directory published by Greater North Dakota Association, 13 Broadway, Fargo, North Dakota, entitled, "Directory of North Dakota Industries and Manufacturers". The Association, however, says (letter of March 15, 1947) that this is no longer available.

OHIO

Manufacturers Directory. Ohio—Department of Industrial Relations, Columbus, Ohio. 1946. 15c.
Material is classified by industry and by location, with number of male and female employes.

OKLAHOMA

Industrial Directory; bulletin no. 1-A. Oklahoma—State Department of Labor, Oklahoma City, Oklahoma. 1932. (Out of Print)
"A partial list of industries in 408 cities and towns" arranged by subject under city, with number of men and women employed.

Oklahoma Manufactures, by H. G. Thuesen. Oklahoma—Agricultural and Mechanical College—Engineering Experiment Station, Stillwater, Oklahoma. 1945.
Locality and product listing.

OREGON

Directory of Manufacturing Plants in Oregon. Oregon—Bureau of Labor, Salem, Oregon. 1946. (In their Biennial report) *
Manufacturing plants, automotive service stations, laundry and drycleaning establishments are listed by county under subject. Gives number of employes.

PENNSYLVANIA

Eleventh Industrial Directory of the Commonwealth of Pennsylvania. Pennsylvania—Department of Internal Affairs, Harrisburg, Pennsylvania. 1946 edition in process.
Firms arranged under counties by industries. Gives, for each plant, the location, number of employes and horsepower used.

RHODE ISLAND (See also Regional List at end)

List of Industrial Establishments in the State of Rhode Island. Rhode Island—Department of Labor, Providence, Rhode Island. 1944. *
Arranged alphabetically by city and name of establishment, with nature of business, number of men, women, boys and girls employed.

Rhode Island Business Directory and Manufacturing Establishments 1947. In: *Providence Journal-Bulletin Almanac*, pp. 88-128, Providence, Rhode Island. 35c.
Arranged by locality and by product. Gives number of employes.

SOUTH CAROLINA

Annual Report of the Department of Labor of the State of South Carolina, Columbia, South Carolina. 1944-1945. Gratis.
Statistics, graphs, and tables covering South Carolina industries. Includes directory of companies arranged by city under subject. Number of employes is indicated by letter symbol. Next biennial report was scheduled for distribution in January, 1947.

Industrial Directory of South Carolina. South Carolina State Planning Board, Columbia, South Carolina. March 1943. (Bulletin no. 5, revised) Classified by product and by county.

SOUTH DAKOTA

South Dakota Directory of Retail Establishments, 1946. University of South Dakota—Business Research Bureau, Vermillion, South Dakota. (Bulletin no. 17) *
Names of firms listed by county and city. Type of retail establishment (restaurant, dairy, theater, garage, etc.) indicated by number symbol. There are 38 definite types of businesses indicated.

South Dakota Industrial and Wholesale Directory, July 1945. University of South Dakota Business Research Bureau, Vermillion, South Dakota. * Classified by cities and products.

TENNESSEE

Tennessee Manufacturers. Tennessee State Planning Commission, 432 Sixth Avenue, North, Nashville 3, Tennessee. 1946. $1.00. (1947 edition scheduled for March 1, 1947)
An expanded directory of manufacturing plants and their products.

TEXAS

Directory of Texas Manufacturers, April 1, 1946. University of Texas—Bureau of Business Research, Austin, Texas. $2.50. (Out of Print)
Classified by cities and products, with date of establishment, extent of product distribution, principal officers, home office, and products code.

UTAH

Utah Manufacturers Association, Salt Lake City, Utah. Membership Roster. August 1940. *
Arranged alphabetically by company or organization.

VERMONT (See Regional List at end)

Official Buyer's Guide to Products and Manufacturers of Vermont. Vermont—Office of Industrial Agent, Montpelier, Vermont. 1942.
Arranged geographically and also by product and by name of manufacturer.

Vermont Year Book. The National Survey, Chester, Vermont. 1946. $3.00.
The directory of manufacturers and wholesalers is Part II of this book. It is a classified list giving name, address, and product handled.

VIRGINIA

Directory of Virginia Industries. Virginia State Chamber of Commerce, Richmond 19, Virginia. 1947. $2.00.
Follows the broader classifications of U.S. Census, with subclassifications under which companies employing 25 or more workers are listed alphabetically. This edition contains, for the first time, a list of firms arranged geographically by towns and cities.

WASHINGTON

Greater Directory of Washington State Products and Manufacturers. Manufacturers' Association of Washington, Arctic Building, Seattle, Washington. 1937. $10.00.
Alphabetical list by company gives date established, officers' names, products, number of employes and, occasionally, capacity. Contains a geographical section and a commodity index.

Selected List of Washington Factories; compiled by Association of Washington Industries, 523 White Building, Seattle 1, Washington. September 1, 1944. *
Lists Washington (State) factories, employing 15 or more persons, alphabetically, under city with principal product and number of employes.

WEST VIRGINIA

Directory of West Virginia Business and Industry. West Virginia—Department of Labor, Charleston, West Virginia. 1946. 15¢.
Arranged alphabetically by company under subject, with approximate number of employes indicated.

WISCONSIN

Classified Directory of Wisconsin Manufacturers, 1945. Wisconsin Manufacturers' Association, 707-708 First National Bank Building, Madison 3, Wisconsin. $6.00.
Alphabetical index of manufacturers, with main listing under place for officers, products, trade names, number of employes and capitalization when known, and branch locations.

WYOMING

Wyoming State Business Directory, 1941-1942. The Gazetteer Publishing and Printing Company, Denver, Colorado. $20.00.
Arranged by cities and towns, and by products. Includes a directory of cattle and sheep men.

REGIONAL DIRECTORIES

NEW ENGLAND

Directory of New England Manufacturers, 1947. George D. Hall Company, Boston 9, Massachusetts. 1946. $25.00.
Contains alphabetical section of companies with officers, products, capital and number of employes; products section, brand names section; and a geographical section broken down by states from Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut.

PACIFIC NORTHWEST

Directory of Pacific Northwest Industries. State Department of Conservation and Development and Office of Secretary of State, State of Washington, Olympia, Washington. Gratis.
Gives name, street address and product made or handled. Arranged by leading cities in Washington and Oregon.

ALASKA

Alaska Business Directory; compiled and edited by Alaska Service. Peter Wood and Company, Box 74, Juneau, Alaska. 1945. $10.00.
A classified directory by city or town with date of establishment of business, names of officers, and products manufactured.

CLASSIFIED BUYERS' GUIDES

Eastern Industrial Directory. Bell Directory Publishers, 1860 Broadway, New York 23, New York. Gratis. 1946.
Covers: New York, Connecticut, Massachusetts, Rhode Island, New Hampshire, Vermont, and Maine.

The Independent Directory for Interstate Commerce and Industry: Central Edition. Independent Directory Corporation, 608 South Dearborn, Chicago 5, Illinois. Gratis. 1946.
Covers: Illinois, Indiana, Wisconsin, Iowa, Minnesota, Michigan, Ohio, W. Pennsylvania, West Virginia, Kentucky, Missouri, Tennessee, Mississippi, Arkansas and Louisiana.

The Independent Directory for Interstate Commerce and Industry: Eastern Edition. Independent Directory Corporation, 152 W. 42 Street, New York 18, New York. 1946. Gratis.
Covers: New York, New Jersey, E. Pennsylvania, Delaware, Maryland, Connecticut, Rhode Island, Massachusetts, New Hampshire, Vermont, Maine, Virginia, North Carolina, South Carolina, Georgia, Florida, and Alabama.

The Independent Directory for Interstate Commerce and Industry: Western Edition. Independent Directory Corporation, 610 South Broadway, Los Angeles 14, California. 1946. Gratis.
Covers: California, Oregon, Washington, Idaho, Nevada, Montana, Wyoming, Utah, Arizona, Colorado, New Mexico, Texas, Oklahoma, Kansas, Nebraska, North Dakota, and South Dakota.

Midwest Industrial Directory. Industrial Directory Publishers, Hammond Building, Detroit 26, Michigan. 1946. Gratis.
Covers: Michigan, Ohio, Indiana, Illinois, and Wisconsin.

Pennsylvania, etc. Industrial Directory Publishers, 1200 Commercial Trust Building, Philadelphia 2, Pennsylvania. 1946. Gratis.
Covers: Pennsylvania, New Jersey, Delaware, Maryland, and West Virginia.

PARTICLE COUNTER

The light scattered from particles as small as a third of a micron in diameter actuates a mechanism which counts them.

AIR-BORNE bacteria and smoke particles actually stand up to be counted in a new device developed in the chemistry department of Northwestern University.

These particles, smaller in diameter than the wave length of light, are too small to be seen in a standard microscope. But they scatter light, and this characteristic is used in the new counting instrument which does for ordinary particles what the Geiger-Müller tube does for charged particles.

A source of light within the tube is scattered by the particles, each particle reflecting a flash of light upon a sensitive photoelectric cell. The resulting electrical impulses are amplified about 200,000 times, making them powerful enough to actuate a mechanical counter.

The instrument, developed under contracts with the OSRD and Army Service Forces, was used to test the efficiency of gas mask filters. In this application it could measure penetration of one smoke particle out of every ten million.

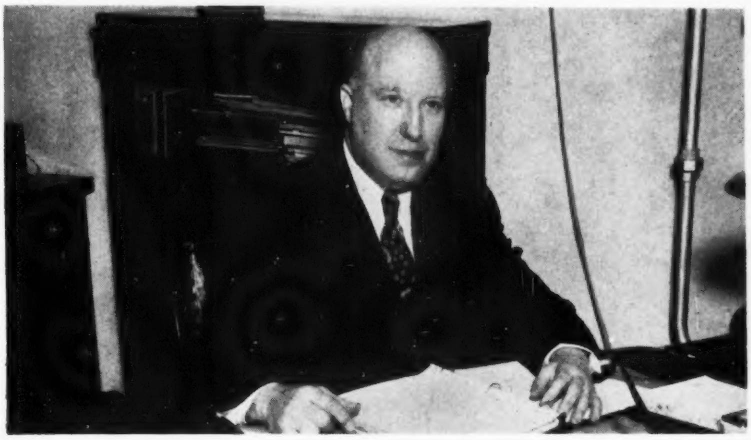
Because it measures liquid or solid, transparent or opaque particles equally well, the counter is expected to be useful in controlling contamination in pharmaceutical plants, industrial fermentations, and other circumstances where sterility is required. Since ordinary unfiltered air gives 1,000 pulses per minute, leakage of unfiltered air into sterile rooms is easily detected.

It appears likely that the instrument might also be a valuable research tool in the study of dusts, smokes, aerosols and other colloids.

THE CHEMICAL PANORAMA

NEWS OF THE CHEMICAL PROCESS INDUSTRIES IN PICTURES

PEOPLE



David E. Pierce, named to the post of chief engineer, General Aniline & Film Corp. He has headed engineering of the G. A. Division for five years.

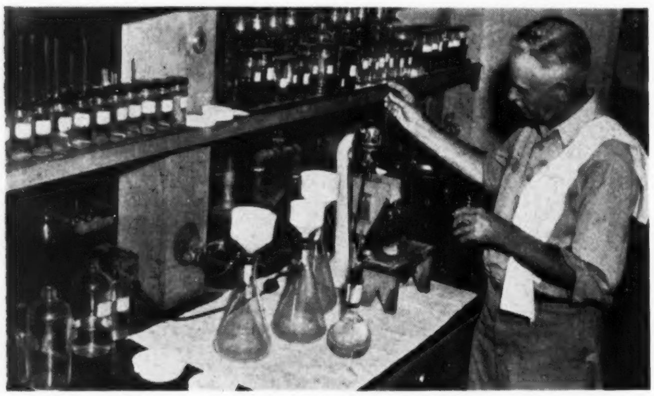
Jack Frye, former president of Trans World Airlines, recently elected General Aniline board chairman.

William P. Drake (right) appointed assistant vice-president, Pennsylvania Salt Manufacturing Co. Here he discusses sales programs with Joseph J. Duffy.

J. Gordon Collins, previously with U. S. Rubber, has joined Amecco Chemicals Inc. as vice-president.

Theodore W. Evans (right) recently named manager of Shell Development Co's Emeryville laboratories, confers with F. F. Rust. He pioneered glycerin studies.

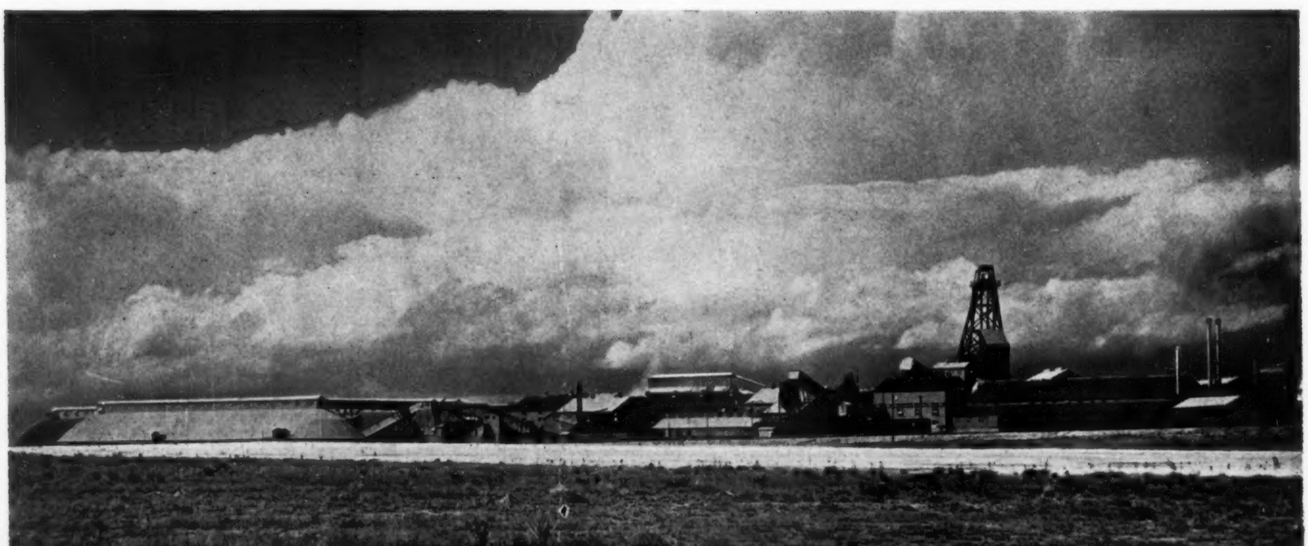
Electric locomotives are used to draw potash-laden mine cars to the main shaft. Nearly 100 miles of tunnel way thread the deposit.



Control and research laboratories are an essential part of the operations.

A Modern Potash

As recently as 1938 the U. S. was dependent on foreign countries for a full half of its potash needs. The war, of course, curbed potash imports, placed a heavy load on U. S. producers. But the challenge of self-sufficiency has been met. Last year refiners delivered 923,000 tons of potash products (K_2O basis) compared with 508,000 tons in 1938. There has been no crisis—no drastic shortage as was the case during World War 1. Output is at an all-time high, but the call for potash as a plant food is also unprecedented. Now the U. S. industry is well established, is laying plans for



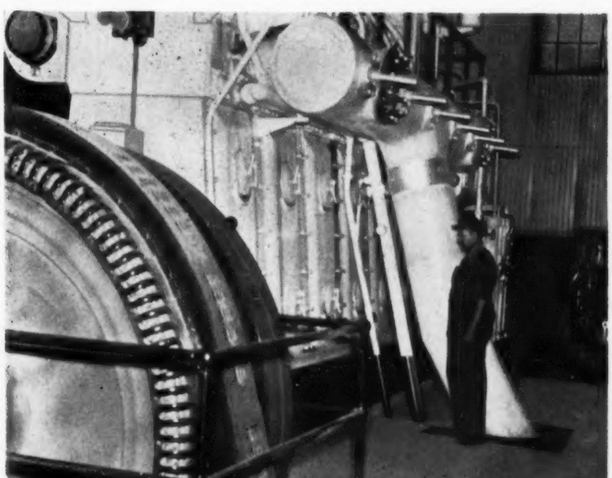
View of potash-producing facilities shows refinery buildings in the center of the group. Structures at left are product warehouses.

Froth flotation of soluble salts is unique feature. Ground ore is carried to flotation units in a saturated solution of ore itself.

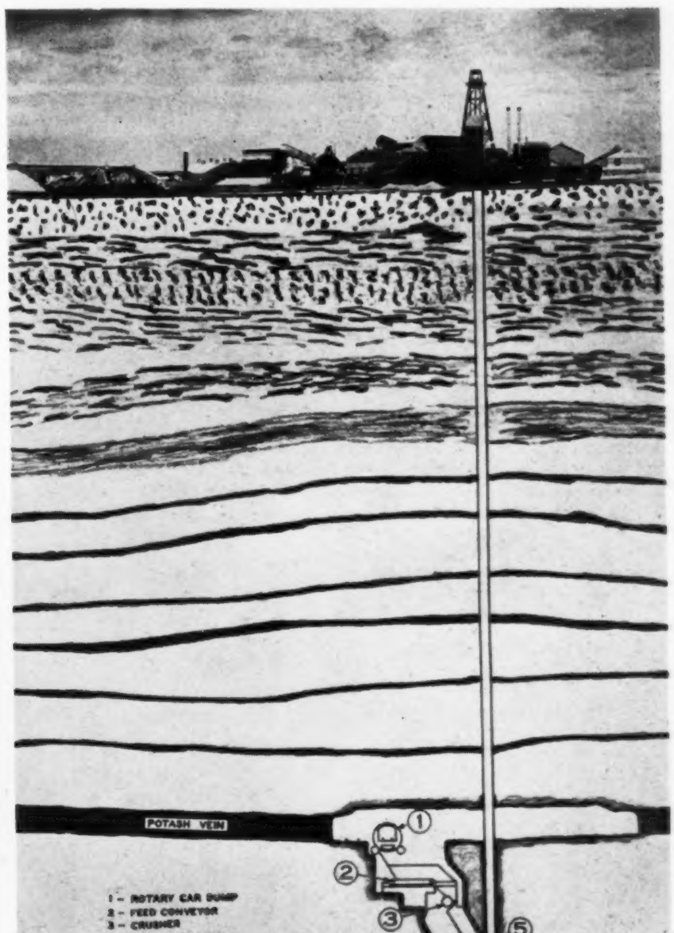
Mining Operation

further expansion, is not too concerned about future foreign competition.

The major portion of increased production came from three mines and refineries in the Carlsbad area of New Mexico, the facilities at Searles Lake, Cal., and the balance from the Salduro Marsh in western Utah. Photographs of one of the New Mexico operations, owned and operated by Potash Company of America, are shown on these pages. This refinery, opened only a decade ago, now has a rated daily output of 1500 tons.



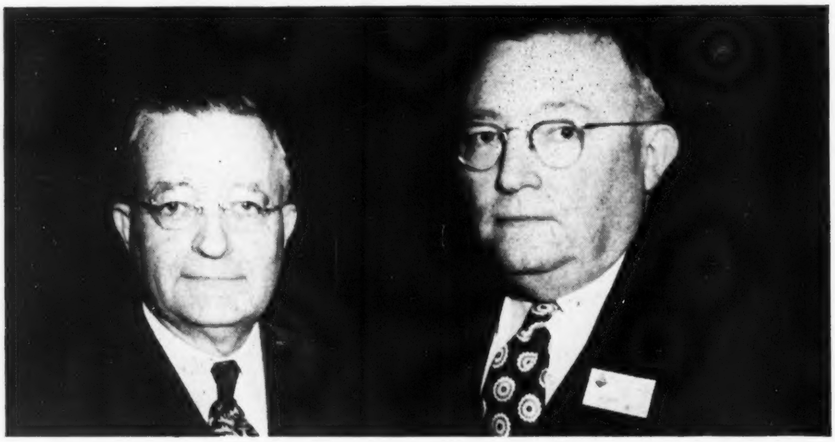
Eight Diesels provide power. Five operate on gas, three on oil.



Cross section shows shaft, sylvinite deposit and underground workings.

British Chemist Visits U. S. Paint Groups

Louis A. Jordan, director of the Paint Research Station at Teddington, England, since its formation in 1926, is in this country for two months under the auspices of the Federation of Paint and Varnish Clubs. Also director of the Paint and Varnish Association of Great Britain and an SCI vice-president and council member, Dr. Jordan addressed a recent joint meeting of the New York Section of the American Chemical Society and the American Section of the Society of Chemical Industry on "Recent Developments in the Paint and Varnish Industry." With Dr. Jordan (left) before the meeting is Wallace P. Cohoe, president of the Chemists' Club.



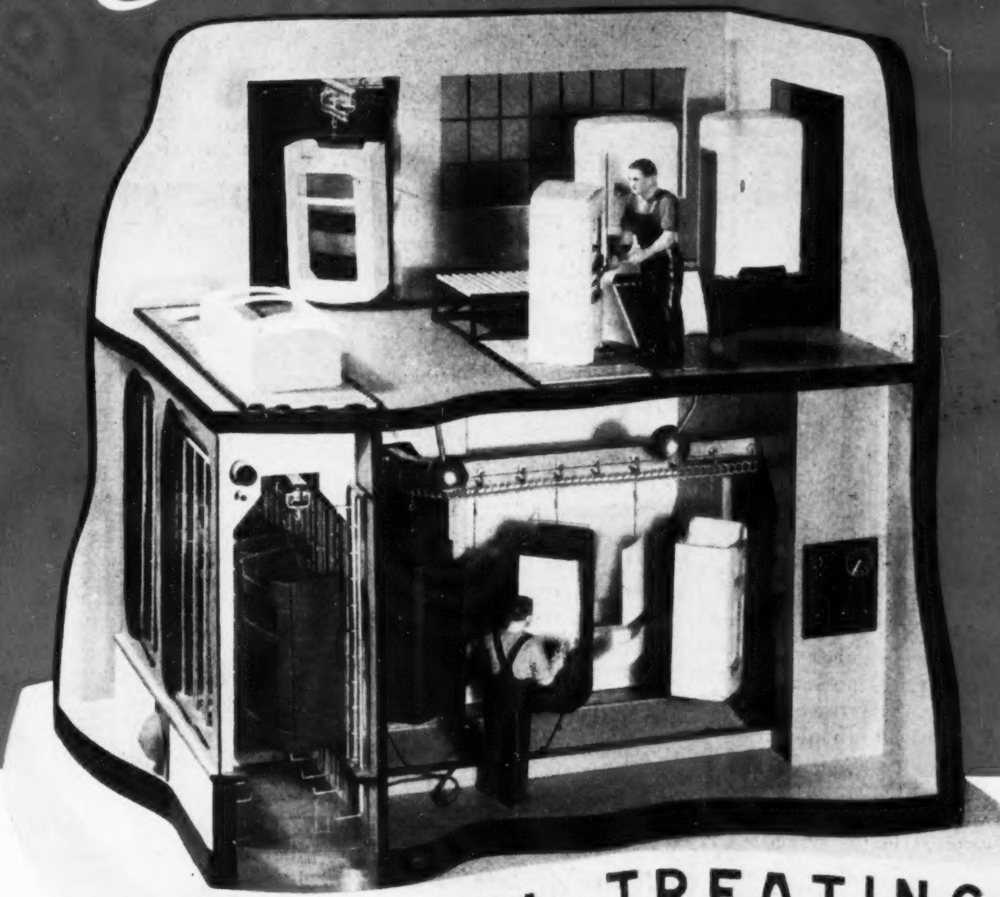
Industrial Wastes

A feature of the recent ACS meeting at Atlantic City was a symposium on industrial wastes, jointly sponsored by the Divisions of Industrial and Engineering Chemistry and Water, Sewage and Sanitation Chemistry. Among the speakers were Sheppard T. Powell (left), of Baltimore, Md., and F. W. Mohlman, of the Sanitary District of Chicago.

Atlantic City Dinner

Among those at the speakers' table at the Subscription Dinner, an event at the Atlantic City meeting of the ACS, were (below) Ralph T. Allee, director of the Inter-American Institute of Agricultural Sciences, Turrialba, Costa Rica; and Laurence Duggan, speaker of the evening, who is director of the Institute of International Education. At top right is Alexander King, British Commonwealth Scientific Office, who brought greetings from British scientists. At lower right is George M. Shuster, president of Hunter College.

VICTOR *Chemicals*



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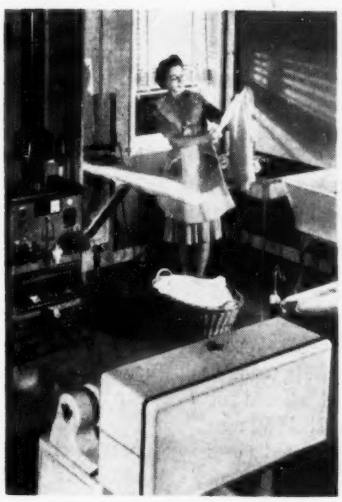
VICTOR CHEMICAL WORKS — UNIFORMITY · PURITY · STABILITY — CHICAGO ILLINOIS



In treating metal for corrosion resistance, phosphoric acid and other specially developed compounds are widely used by manufacturers of automobiles, telephones, refrigerators, washing machines, water heaters, stoves and similar appliances. These compounds form effective, rust-retarding phosphate coatings on iron and steel surfaces and provide a more perfect bond where paint is to be applied. ¶ Victor chemicals used in metal treating, cleaning, plating, and the manufacture of alloys include: **Ferrophosphorus** (manufacture of special steels), **Hemisodium Phosphate** (contact tinning of brass), **Oxalic Acid** (cleaning railroad cars, brass polish, rust-proofing), **Phosphoric Acid** (metal cleaning compounds, rust-proofing, railroad car cleaning, electropolishing), **Phosphorus** (manufacture of phosphor-copper), **Sodium Acid Pyrophosphate** (contact tinning), **Sodium Formate** (plating baths), **Sodium Phosphates** (cleaning compounds, tin plating, degreasing), **Wetting Agents** (accelerate action of cleaning compounds).

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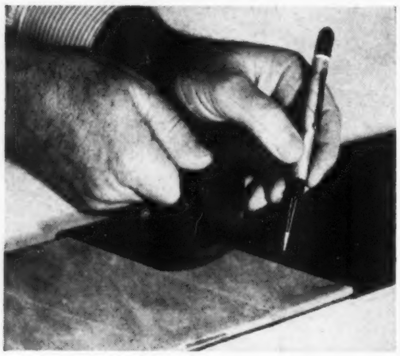
NEW PRODUCTS & PROCESSES

Plastic Coating Protects Process Equipment NP 485

A new, inexpensive method for protecting process equipment such as pipe, valves, fans and rotors and other intricately shaped equipment has been worked out by the U. S. Stoneware Co.

This new liquid Tygon, known as Tygoflex, is a formulation consisting of 100% solids and containing no volatiles such as



water, thinners, solvents or reducers. When applied by the usual techniques of dipping, spraying or brushing and subsequently subjected to heat for a short period, it converts to a thick, protective insulator resembling in appearance a glossy black rubber compound of medium hardness.

Tygoflex can be applied to any surface or material which will withstand the time and temperature involved in the fusion, such as metals, ceramics, glass, and heat-resistant plastics such as Duralon. Thicknesses ranging from $\frac{1}{16}$" to $\frac{1}{4}$" can be built up in a single dip.

Tygoflex possesses the same corrosion-resistant properties as the basic Tygons, being resistant to all mineral acids, dilute or concentrated, alkalies, salts, oxidizing agents, and a limited range of solvents. Its upper-temperature limits are substantially above that of the other Tygon plastics, ranging as high as 250° F.

Synthetic Rubber NP 486

A "super processing" synthetic rubber, closely related to GR-S, which improves the appearance and production efficiency of many rubber products has been developed by United States Rubber Company. The product obtains its unusual properties from the addition of about one-half of one per cent of a special cross-linking agent.

Rubber boots and shoes, bathing caps, and other articles having a bright, shiny appearance and produced in white or any color are possible with the new rubber. It also improves the finish of tire side-walls by reducing molding blemishes.

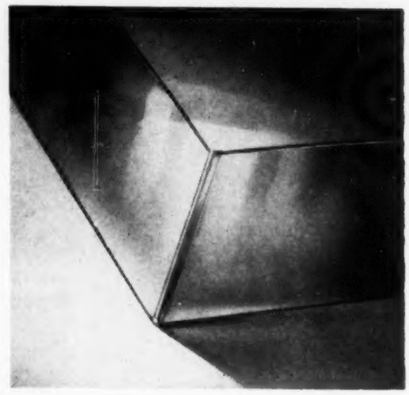
In some applications the new material is said to be easier to process than natural rubber. It gives better retention of embossed design, resulting in a smoother finish. Also, pieces of rubber sheet cut from patterns shrink much less during fabrication. The super processing synthetic will be made in two types, regular and non-staining. The latter can be used in white or light colored articles.

High-Frequency Sealing of Cellulose Acetate NP 487

A new application of electronic sealing to transparent box manufacture, developed by the Eastman Kodak Company, is expected to reduce waste, improve box appearance, lead to greater uniformity of product, and eliminate the distortion sometimes caused by the cementing operation usually employed in transparent box manufacture. It is applicable to acetate sheet from thicknesses of .005-inch and heavier.

No cement is used in sealing transparent boxes with this new method. The technique consists merely of firmly clamping overlapping portions of the box ends and sides between two electrodes. The "deep-heat" so produced fuses the two pieces of acetate in as little as $\frac{1}{4}$ of a second.

In spite of the high temperature developed within the acetate sheet, the outer surfaces remain cool, and the electrodes never heat up. Box seams produced by this method are only $\frac{1}{16}$-inch wide and almost invisible.



Names of manufacturers of high frequency equipment who have indicated their willingness to supply both generators and electrode assemblies will be furnished by Kodak upon request.

Hexamethylene Diisocyanate NP 488

Hexamethylene di-isocyanate is one of the series of polyisocyanates, interesting because of their extreme reactivity, especially with organic and inorganic materials having an active hydrogen atom, and also because of their poly-functional character.

Hexamethylene di-isocyanate as prepared is a water-white colored liquid that turns straw colored on standing. It has a pungent odor, is a lachrymator and a skin irritant which will probably cause dermatitis. Many of its suggested uses involve its application from solution in such solvents as benzene, xylene, orthodichloro and benzene.

Physical Characteristics: molecular weight, 168; boiling point, 143°C./20 mm., and specific gravity, 1.04 at 28°C. The distilled products are completely miscible in all proportions at room temperatures with a wide range of inert organic solvents; e.g., acetone, ethyl acetate, carbon tetrachloride, kerosene, toluene and nitrobenzene. It tends to polymerize on standing and should not be used after six months shelf aging.

Hexamethylene di-isocyanate, technical, a dark brown mobile liquid, is a 50%

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Please send me more information, if available, on the following items. I understand that nothing further may be available on some of them.

NP 485	NP 488	NP 491	NP 494	NP 498
NP 486	NP 489	NP 492	NP 495	NP 499
NP 487	NP 490	NP 493	NP 496	NP 500
			NP 497	NP 501

Please Print:

Name .... (Position) ....

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City.............................. Zone...... State...........

solution of technical grade hexamethylene di-isocyanate in o-dichlorobenzene. The solvent can be removed by distillation in vacuum at 30 mm. Hg. or less. The technical grade hexamethylene di-isocyanate, also a dark brown liquid, can be purified by distillation in vacuum at 20 mm. Hg. or less. The distilled product is a water-white liquid when freshly distilled.

A loss of 20-25% of hexamethylene di-isocyanate is experienced when the technical grade material is purified by vacuum distillation, because of polymerization in the still pot. It is available from the Chemical Division of the Organic Chemicals Department of E. I. du Pont de Nemours & Co., Inc.

Stearic Acid Replacement NP 489

A replacement for triple and double pressed stearic acid is offered by the Woburn Chemical Corp.

The chemical, officials explained, is now in production and has been accepted by several manufacturers in place of formerly used stearic acids.

The new products are said to be practical for lubricants, metallic soaps, pharmaceuticals, emulsifying agents, cosmetics, and buffing compounds. They are as yet unnamed, having laboratory classifications 147 and 148.

Standard Synthetic Resin Solutions NP 490

To fill the need in the development and research field for the various synthetic resin solutions which can be used for preliminary laboratory evaluations, Centro Research Laboratories has developed a preliminary group of 48 such solutions.

These solutions have been isolated in this laboratory as useful standards. Their characteristics and formulations should prove valuable especially to those concerned with the practical use of synthetic resins, varnishes, lacquers or coatings.

The systems are packed in a standard container of approximately 3 pints, labeled with the formulation and showing per cent solids, viscosity, application data, etc. On request, more details concerning any individual system may be supplied by Centro.

Low Temperature Polymerization of GR-S NP 491

The combination of a new chemical catalyst and a new low temperature process for the polymerization of butadiene and styrene yields a synthetic rubber which appears to be equivalent to natural rubber in many important properties. The improved product does not have the tendency to crack and skid or lose strength when it generates heat when made into tires; and it is less sticky to work with than the present general-purpose synthetic.

Experts report the new technique licks

two major problems of making the low-temperature synthetic: the extreme slowness with which butadiene and styrene combine to form rubber; and the formation of ice in handling the materials at frigid temperatures.

Preliminary estimates indicate the new process can produce rubber at a cost comparable to that of GR-S, now sold by the Government at 18½ cents a pound. Industry experts figure it can be made for about 13 cents. This compares with the Government's selling price of natural rubber at 25¾ cents a pound.

The Government's present big GR-S type plants could be adapted for manufacturing the new type of rubber, but would require additions and modifications.

The technique was developed by the Phillips Petroleum Co.

Pentamethylene Glycol NP 492

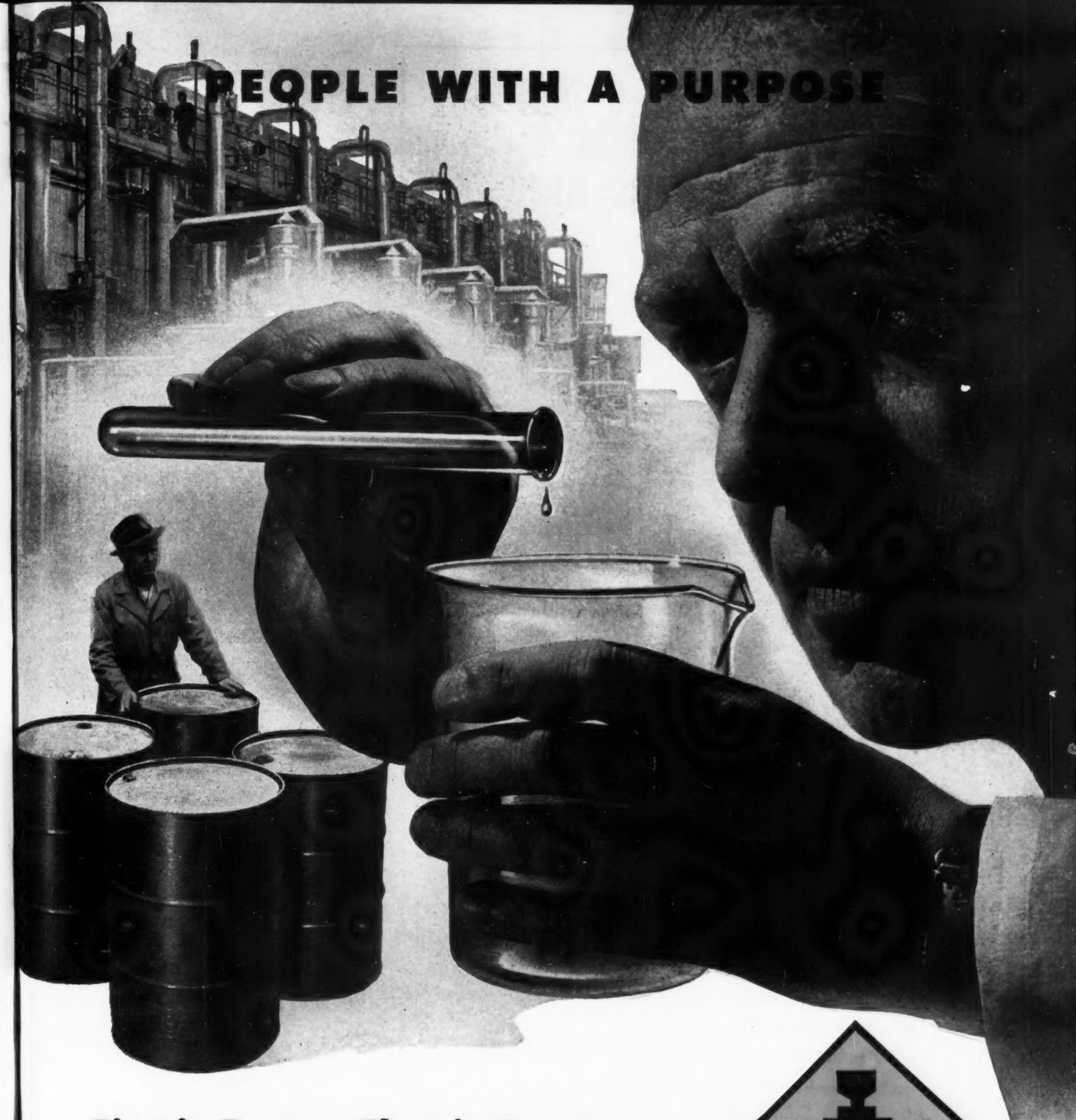
Pentamethylene glycol (or 1,5-pentanediol) is a colorless, viscous liquid of molecular weight 104.15 and specific gravity 0.9938. While it has no odor, its taste is burning or bitter. It is miscible in all proportions with water, methanol, ethanol, acetone and ethyl acetate; soluble in diethyl ether at 25° C. to the extent of about 11 per cent by weight; and insoluble in benzene, trichloroethylene, methylene chloride, petroleum ether and heptane.

This new product can be readily adapted to the preparation of various esters and polyesters which may be useful as plasticizers, emulsifying agents, and resin intermediates. Pentamethylene carbonate may be suitable for use with cellulose esters in plastic and coating compositions. Polyesters of 1,5-pentanediol have possibilities in the textile industry as plasticizers for fibers such as cotton, rayon, wool, mohair, silk and nylon, increasing their elasticity and flexibility. The cyclic esters can be used in the preparation of perfumes. It is possible that 1,5-pentanediol may be found to be useful in various applications where glycols are commonly employed, such as brake fluid compositions, certain inks, dyes, paints, paper, and in films. Developed by the Electrochemicals Division, E. I. du Pont de Nemours & Co., Inc., it is now available in limited quantities for research and development purposes.

Drying Oil Odor Eliminated NP 493

Pungent, tarry odors which have limited the use of petroleum drying oils by the printing ink industry may be eliminated by a new chemical process developed at the National Printing Ink Research Institute at Lehigh University.

Petroleum drying oils are unsaturated by-products resulting from the cracking of crude petroleum for the manufacture of gasoline. They have excellent drying



First in Drops...Then in Drums

Just a few precious drops herald the production to come. Today in Oronite laboratories, research people are gathering the know-how to make more and better industrial chemicals available. Later, new chemical products will flow in quantity.

Here again is an example of the service Oronite will continue to render to manufacturers. Yesterday, today and tomorrow, you can look to Oronite for leadership in industrial chemicals.

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properties but their extensive use in printing inks has been limited by their objectionable odor. The new process removes this odor and renders the resulting oil as bland as linseed. The Institute is temporarily concentrating all efforts and resources on the discovery or development of new drying oils.

Aluminum Flux NP 494

All-State Welding Alloys Co. offers a new aluminum flux for brazing sheet aluminum, which has a low melting point of around 950° F. and becomes quite active at 1,000° F. Unlike most other fluxes, it breaks down into a completely liquid state and gives excellent capillary action to the aluminum brazing alloy. If the parts that have been welded are submerged in hot water while still hot, nearly all traces of the flux are removed; unlike other fluxes of this type on the market, this flux leaves little trace of any flux residue on the work nor any noticeable dark areas. One other feature is that in its wetting action during the preheat period, it goes from a powder form directly into a clear liquid, which helps carry the brazing alloy along the seams or joint to be welded; it does not leave unmelted granules of flux which retard the flow of the brazing alloy. This flux, known as All-State No. 31A flux, may be used with All-State No. 31 sheet aluminum brazing rod in the brazing of all types of sheet aluminum.

General Detergent NP 495

Detergent 240, a new synthetic detergent for general use, is compatible with alkalies such as phosphates and carbonates, and is efficient in hard water.

A sulphonated petroleum derivative, it is a dry non-hygroscopic compound available in flake or powder form. A 1% solution has a pH of 7.5—8.0. It is now ready for delivery in fiber drums of 225-240 pounds from Arnold-Hoffman & Co.

Toluene 2,4-Diisocyanate NP 496

Toluene 2,4 di-isocyanate, $CH_3C_6H_3(NCO)_2$, is extremely reactive, especially with organic and inorganic materials having an active hydrogen atom, and is poly-functional in character. As prepared, it is a water-white liquid that turns straw colored on standing. It has a pungent odor, is a lachrymator and a skin irritant.

Physical Characteristics: molecular weight, 174; boiling point, 129°C./15 mm., and specific gravity, 1.21 @ 28°C. The distilled products are completely miscible in all proportions at room temperatures with a wide range of inert organic solvents; e.g., acetone, ethyl acetate, carbon tetrachloride, kerosene, toluene and nitrobenzene. It tends to polymerize on

standing and should not be used after six months shelf aging.

Toluene 2,4 di-isocyanate, technical, a dark brown mobile liquid, is a 75% solution of technical grade toluene 2,4 di-isocyanate in o-dichlorobenzene. The solvent can be removed by distillation in vacuum at 30 mm. Hg. or less. The technical grade toluene, 2,4 di-isocyanate, also a dark brown liquid, can be purified by distillation in vacuum at 15 mm. Hg. or less. The distilled product is a water-white liquid when freshly distilled.

A loss of 15-20% of toluene 2,4 di-isocyanate is experienced when the technical grade material is purified by vacuum distillation, because of polymerization in the still pot. It is offered by the Chemical Division, Organic Chemicals Department, E. I. du Pont de Nemours & Co., Inc.

Modified Alcohol Sulfate Detergent NP 497

A free flowing, non-sneeze, offwhite granular powder with a pleasing soap-like odor is Alrosene 31. This new modified alcohol sulfate detergent contains 31 per cent active ingredient, 69 per cent inorganic salts and moisture, and is neutral in 1 per cent solutions. The density is 0.67 and surface tension of 1 per cent solution (at 20°C) is 30 dynes/cm.

Alrosene 31 shows no reduction of foaming in hard water or sea water: Foam is unaffected by alkali or acid. It is compatible with soaps and shows no decrease in foaming when compounded with them.

Alrosene 31 finds its main application in soaping prints, improving shade brightness and hand, eliminating scumming, and reducing color bleeding. As a scouring agent for raw wool, rayons, acetates, cottons, it permits operation at lower temperatures, causes no lime deposits, discoloration, rancidity, or interference with further processing.

Suitable for formulation of household cleaning compounds, this product shows greatest efficiency for dishwashing and general laundry use when mixed with alkalis. Other uses are in washing compounds for metals, furs, fruits, and vegetables, automobiles, rugs, upholstery, dairy and food equipment, commercial laundering and wet cleaning, janitor and maintenance supplies and bubble baths. Alrosene 31 is made by the Alrose Chemical Co.

Glass Fabrics NP 498

Three glass fabrics with features of particular interest to plastic processors are now on the market. Modigliani flexible glass fabric is a firmly bonded unwoven pliable glass fiber fabric in sheet form. It is useful wherever fiber reinforcement of resins is required.

Modigliani elastic glass fabric is of a specially controlled texture, pliable, with

the added property of conformability to random shapes. Its construction resembles conventional elastic. It is particularly suitable for deep-drawn low pressure laminates. Its apparent unidirectional stretch achieves a multidirectional aspect when fabric of sufficient width is conformed to such a surface as a hemisphere. Modigliani glass veil is a refinement of the flexible fabric. It is the only unwoven glass fabric available in super-thin construction in the range of 2½ mils. thickness.

All of these fabrics, distributed by the Wilmington Chemical Corp., can be used alone or in combination with other materials as reinforcements for sheet, laminated, or shaped plastic products. They are compatible with polyesters and a wide range of the other resins commonly used in plastic reinforcement. The veil has special merit as a reinforcing or surface finishing material for other materials used in reinforcement as paper, adding strength, texture and color to the same.

Pyran Derivatives NP 499

Dihydropyran, a colorless, mobile liquid with an ether-like odor, has a molecular weight of 84.114 and boiling point, 86° C. at 760 mm. It is soluble in most common organic solvents and in water (3.0 gms. in 100 cc. at 20° C.)

A very reactive compound, dihydropyran, when hydrolyzed with dilute mineral acid solutions, adds a mole of water at the double bond. This is followed by opening of the ring to form δ-hydroxyvaleraldehyde plus a bicyclic acetal, di-2-tetrahydropyryl ether, as a by-product. The open-chain hydroxyaldehyde exists in equilibrium with the closed chain inner acetal. The two products can be separated by distilling from neutral solution.

Dihydropyran is readily halogenated with chlorine or bromine to form 2,3-dichloro-tetrahydropyran or the corresponding bromo derivative. The halogen in the 2-position is highly reactive. Addition of phosgene to dihydropyran gives a black crystalline material which, upon loss of hydrogen chloride, generates 2,3-dihydro-5-pyroyl chloride. Passage of dihydropyran over silica at 500° C. gives mainly acrolein plus ethylene.

Tetrahydropyran is readily obtained by hydrogenation of dihydropyran. It resembles dihydropyran in appearance and odor. Molecular weight is 86.13; boiling point, 88° C. at 760 mm. Tetrahydropyran is miscible with water, but less soluble in hot than cold water, (immiscible with water at 100° C.). It is miscible with alcohol, ether, and most of the common organic solvents.

A powerful solvent, tetrahydropyran may be useful for the dissolution of many commercial plastic materials, including cellulosics, rosin and ester gum, vinyls, polystyrene and chlorinated rubber.

These new products may be obtained in

limited quantities from Electrochemicals Division, E. I. du Pont de Nemours & Co., Inc.

Fiberglas Mat for Plastics Reinforcement NP 500

A new Fiberglas mat (T36) for use as reinforcement in the manufacture of laminated plastic products, and in the production of flat plastic sheets, is manufactured by Owens-Corning Fiberglas Corporation. The reinforcing mat is formed of cut lengths of glass textile fibers, bonded with a resin.

T36 is pliable, without fluffiness, and retains the all-important strand integrity of the fibrous bundle. Weight is one ounce per square foot.

Two types of T36 mat are available. T36M is bonded with a thermoplastic resin compatible with the polyester laminating resins. T36K is bonded with a thermosetting resin compatible with phenolic and melamine laminating resins.

T36M can be heated before impregnation (200 to 225 F.) and preformed to the desired shape. Because the binder is soluble in the polyester laminating resins, the mat can be easily draped in the mold after impregnation, reducing the need for tailoring.

It is expected that the T36M mat and polyester resins will be widely used in place of metals in applications where frequent design changes are required; or, where costly metal-finishing techniques are employed. T36K mat is expected to find wide application in the manufacture of reinforced phenolic sheets and formed parts.

Drying Oil Extender NP 501

Advance Solvents & Chemical Corporation has introduced a new liquid extender for drying oils. The material is very light in color, according to the company, and is suitable for white flat paints and white enamels. It is designated as "Advaresin 200 Liquid."

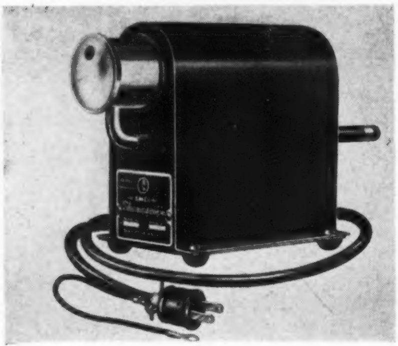
Acenaphthylene Resins NP 502

Acenaphthene, found in coal-tar, yields acenaphthylene upon dehydrogenation. The latter can be polymerized in bulk by heating at 98° C. for 72 hours to yield a resin of molecular weight of 90,000 which is soluble in benzene, or by heating with benzoyl peroxide to a high-molecular-weight polymer. It can also be polymerized in solution and at low temperatures with ionic-type catalysts. Acenaphthylene will copolymerize with other monomers such as styrene, methyl methacrylate, and vinyl carbazole. The polymers are useful as film-forming materials, as coating agents, as bonding agents, as impregnants, as molding materials, and particularly as dielectric materials.

NEW EQUIPMENT

Vacuum Gage QB 220

The "Skanascope" of Distillation Products, Inc. measures the degree of vacuum by indicating through color on a fluorescent screen—instead of by means



of needle and scale—the total number of molecules per unit volume in the system. This includes all residual gases and vapors, regardless of their condensability.

The gauge operates continuously, making it particularly adaptable for production work. It monitors the total pressure of permanent and condensable gases and compensates for the effect of temperature changes on the system. No calibration or zero setting is needed.

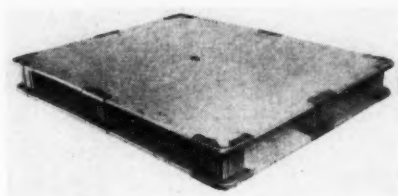
Steam Condensate Purity Control QB 221

The solu-bridge controller of Industrial Instruments, Inc., an electrolytic conductivity method, operates warning signals or the valves direct to divert flow of contaminated steam condensate. It consists of two basic circuits: (1) An A.C. Wheatstone bridge designed for operation from line voltage with a cathode-ray "eye" tube as the balance indicator; and (2) a self-contained single-pole double-throw relay which reacts sharply to the unbalance of the Wheatstone Bridge and delivers line voltage A.C. up to 2 amps., to operate warning signals or electrically-operated valves when the bridge is unbalanced.

The relay terminals in the controller are wired to the solenoid or motorized valves located in the return lines at such points that, upon signal from the controller that contamination is present, the valves operate to divert the flow of condensate to waste. At the same time a bell or lamp may be operated to warn of the presence of contamination.

Pallets QB 222

The new pallet of the Clark Tructractor Division of Clark Equipment Co. is constructed with ⅝-inch plywood decks and posts of plywood blocks or metal, and weighs only a little more than half as much as a comparable hardwood pallet.



It is double-faced, designed for four-way fork entry, and can be furnished in the metal-post construction for use with hand-lift or motorized pallet trucks.

The durable plywood pallet is offered in sizes ranging from 30" x 40" with 2" vertical clearance and weighing 36 pounds, up to 48" x 60" with 3¾" clearance weighing 89 pounds. Capacities are 4,000 pounds carrying load, and 16,000 pounds static load.

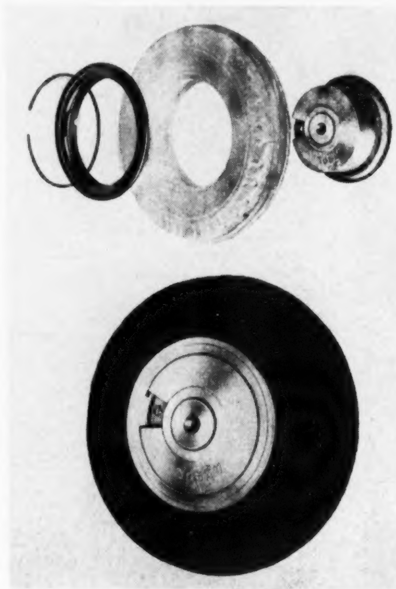
Tank Coatings QB 223

Carbo tank coatings, produced by Carbozite Protective Coatings, Inc., are fully suspended and non-bleeding. They are resistant to abrasion and to temperatures up to 300° F. Standard colors are black, white, gray, and aluminum.

Carbo tank coatings may be troweled, brushed, or sprayed and stencils may be applied over them with Carbo white marking paint.

Wheel QB 224

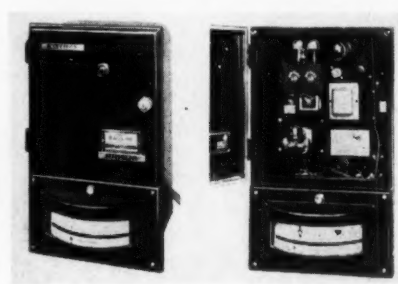
The new pneumatic wheel of the Aerol Co. for use on materials handling equipment enables a tire change to be made in less than one minute. In attach-



ing the tire enough air is placed in it to round it out before being placed on the main body of the wheel. After this the detachable rim is slipped in place by hand and the special snap ring placed in position. No tools are needed or is it necessary to remove the wheel.

Temperature Control QB 225

The new temperature-variation control instrument, the Xactline Capacitrol, of the



Claud S. Gordon Co. combines in one complete unit all the outstanding features of the Claud S. Gordon Co.'s Xactline control unit and the Wheelco Instrument Co.'s electronic principle Capacitrol.

The Xactline furnishes "anticipating" factor which holds temperature tolerances as close as ± 1/5°F. and power "on-off" cycles as short as 3 seconds, positive electrical action—no gears—cams—motors—

CHEMICAL INDUSTRIES TECHNICAL DATA SERVICE

CHEMICAL INDUSTRIES, 522 Fifth Ave., New York 18, N. Y. (5-7)

Please send me more detailed information on the following new equipment:

QB 220	QB 224	QB 228	QB 233	QB 238
QB 221	QB 225	QB 229	QB 234	QB 239
QB 222	QB 226	QB 230	QB 235	QB 240
QB 223	QB 227	QB 231	QB 236	QB 241
		QB 232	QB 237	QB 242

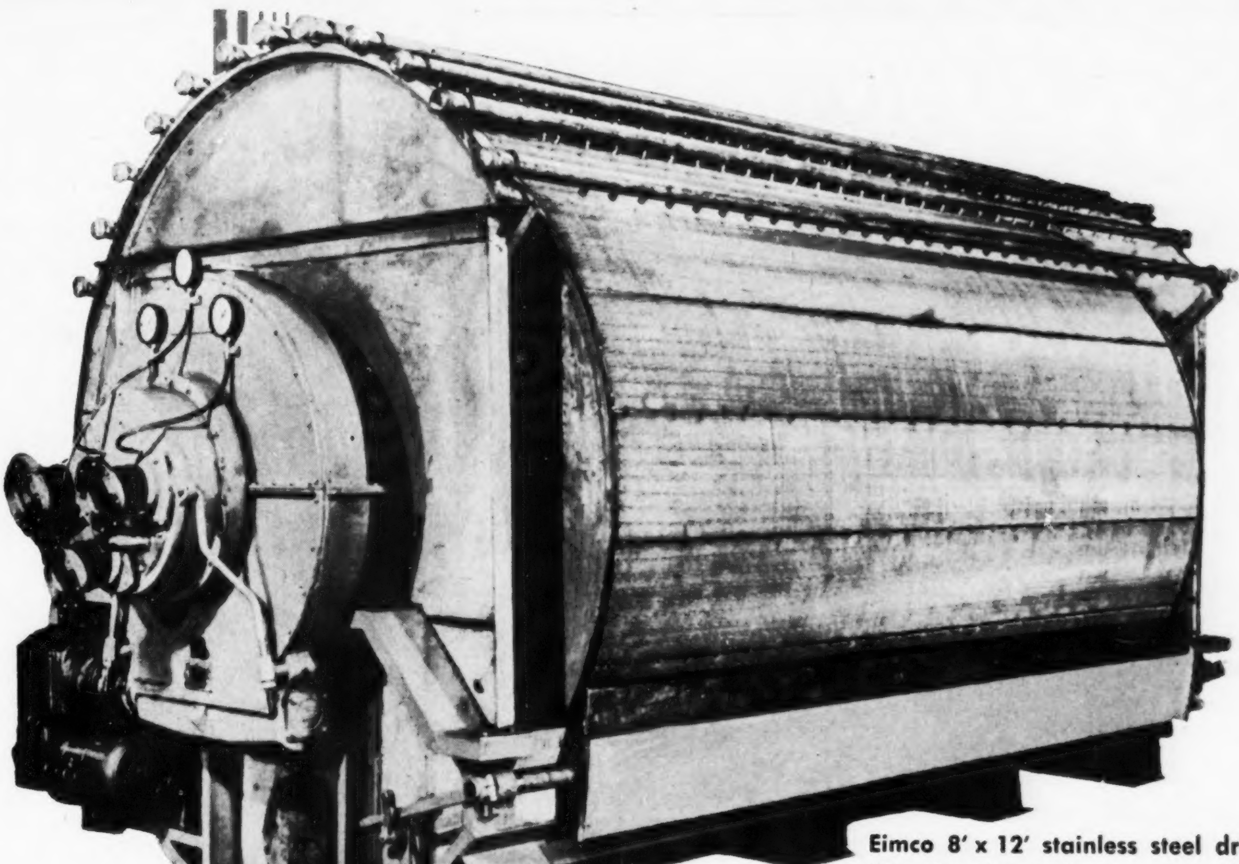
(*Please print*)

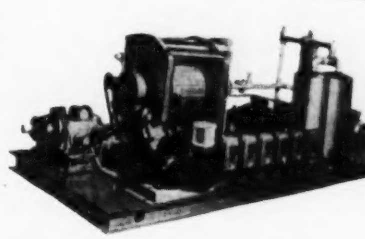
Name ....

Company ....

Street ....

City & State ....



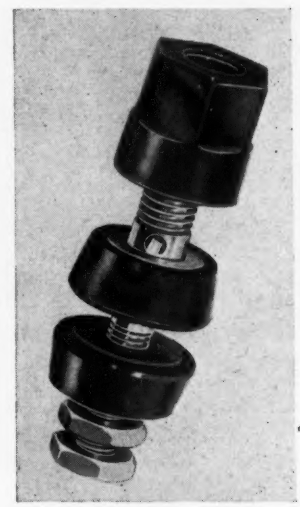


bearings or other mechanical devices, simple adjustment for wide range control requirements, and low initial cost plus low cost operation. The Capacitrol furnishes the electronic control principle, instantaneous control action, direct reading indicating scale, separately enclosed measuring instrument, and interchangeable unit construction.

The new Xactline Capacitrol is available in two distinct models for varying requirements.

Binding Post QB 226

The new binding post (type DF30) of the Superior Electric Co. meets the need for a multi-purpose electrical connector.



The new binding post offers five ways of connecting leads. They are: permanent clamping of wire up to size #12 through the center hole; looping of wire around the center shaft and clamping; plug-in connection of a standard ¾ inch center banana plug; clip-lead connection by removing the hexagonal shaped phenolic head; and spade lug connection.

Metallizing Unit QB 227

A new powder metallizing unit, the Colmonoy Spraywelder, was developed for use in conjunction with the Colmonoy Sprayweld Process. The unit is operated in the first part of the process as a powder metallizing unit to apply a uniform overlay of the powdered metal. It is then used as a conventional welding torch to fuse this sprayed overlay to the base metal to obtain a fusion or molecular bond, identical to that obtained when the same alloy in rod form is applied by acetylene welding.

Splash-Proof Synchronous Motors QB 228

The new "Heavy-Duty" synchronous motors for constant-speed drives up to 1000 HP of Electric Machinery Mfg. Co. are available in splash-proof construction.

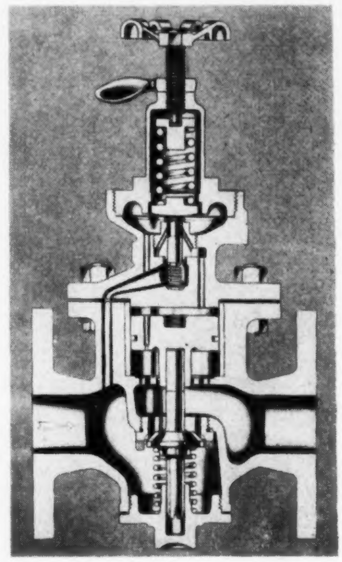
The stator frame is of steel. Brush inspection and blowing out is simplified

with access plates designed for speedy removal and replacement. The sealed bearings can be cleaned and refilled without motor disassembly. Double-end ventilation is provided by a blower on each end of the rotor and the exciter also is fitted with blower.

It is available in unity or leading power factor, with torque and kva requirements to suit the job.

Overflow Valve QB 229

The new throttling type unloading valve of the Leslie Co., class UL, for use with steam, air or gas is applicable wherever a throttling type regulating valve is re-



quired to maintain a constant inlet pressure by relieving the excess to a lower pressure system.

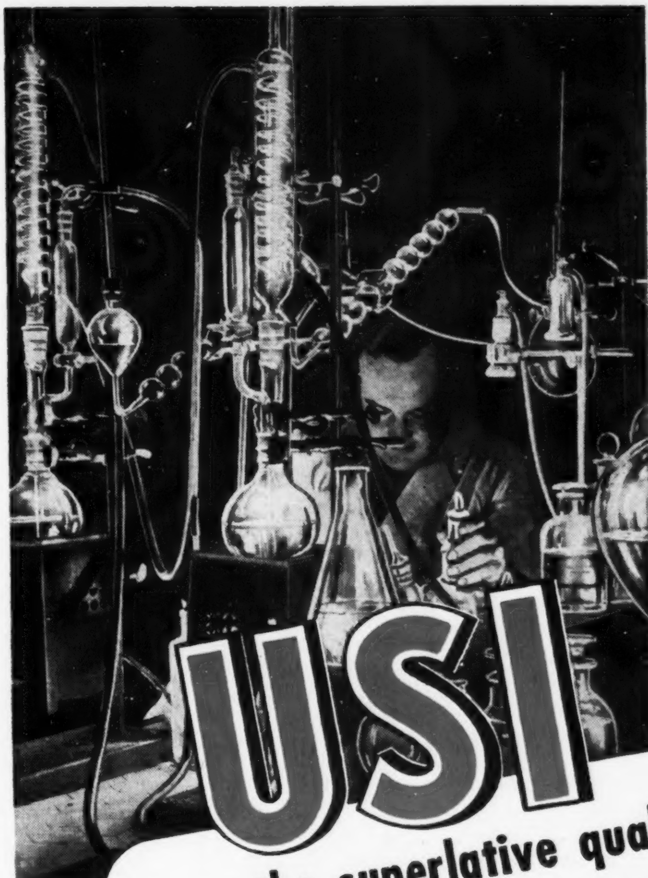
Construction features include high pressure bronze body, renewable wearing parts, hard surfaced seat ring, hardened stainless steel main and controlling valves, bronze piston, corrosion resistant piston rings, phosphor bronze diaphragm. It is available in sizes from ½" to 4"; for inlet pressures from 25 to 300 psi., inlet temperature to 550°F. and pressure difference not less than 15 psi.

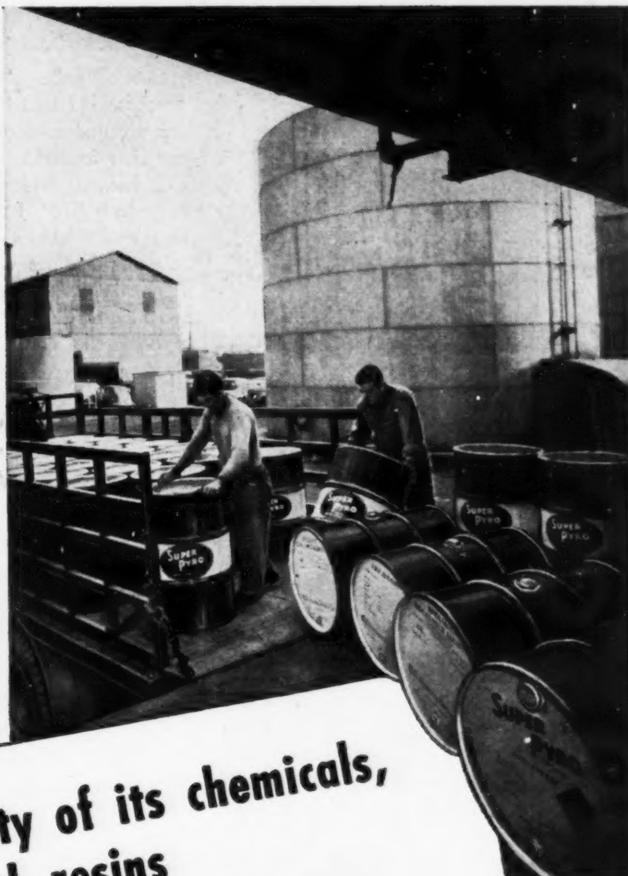
Feed Pump Stroke Adjustment QB 230

The improved micro-indicating stroke adjustment, now supplied as original equipment on standard Milton Roy chemical pumps, provides precise control of plunger stroke by a hand wheel. A vernier dial permits quick resetting to any predetermined stroke length, to within 1/750 of the full length of the full stroke without stopping the pump. An automatic motorized stroke adjustment is also available.

Safety-Release Valve QB 231

A simplified relief valve, Model No. 2745, for pressures up to 10,000 psi, has





USI
—the superlative quality of its chemicals, solvents and resins is *kept* that way by Tri-Sure Closures

Some of the Industries in which U.S.I. Chemicals are Vital Factors

AUTOMOTIVE, AVIATION PETROLEUM
•
HEAVY AND INDUSTRIAL CHEMICALS
•
DYES AND INKS
•
PROTECTIVE COATINGS
•
PHARMACEUTICALS AND FINE CHEMICALS
•
MEDICAL, SCIENTIFIC
•
CHEMICAL SPECIALTIES
•
COSMETICS, TOILET GOODS

FROM penicillin to perfume . . . from dyes to drugs . . . there is scarcely a limit to the range of products that owe their quality to U. S. I. Chemicals.

This quality is developed in laboratories that are world-famous for zeal in research; it is maintained in manufacturing plants that are a standard of skill in processing; and it is *guarded* in transit by drums that are *safe* for fine chemicals.

For over 15 years, U. S. Industrial Chemicals, Inc. has used Tri-Sure Closures as seals of protection for its products, and for several years has specified that all new drums be equipped with Tri-Sure Closures.

Among the U. S. I. Products which require perfect protection in transit are alcohol and alcohol products . . . synthetic chemicals for pharmaceutical use . . . alcohol solvents and chemicals . . . 190 proof alcohol for pharmaceutical manufacturers . . . synthetic resins . . . anti-freeze . . . food products.

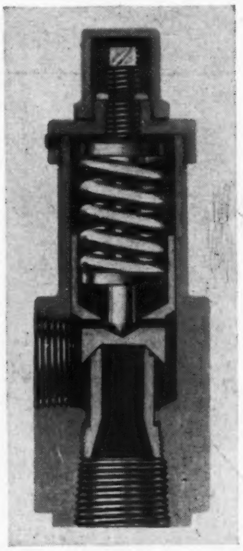
In Tri-Sure equipped drums these products are guarded every mile and minute from contamination, evaporation, substitution — and delivered as fine products should be: with exactly the same quality that left the plant.

Tri-Sure
Reg. U. S. Pat. Off.
CLOSURES

AMERICAN FLANGE & MANUFACTURING CO. INC., 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.
TRI-SURE PRODUCTS LIMITED, ST. CATHARINES, ONTARIO, CANADA

been fabricated completely from bar stock by Farris Engineering Corp.

It is available in 3 body sizes—½", ¾" and 1"—interchangeable nozzle in-

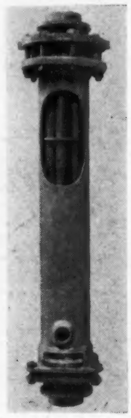


serts provide for proper capacity at set pressures in three ranges—2,000, 5,000 and 10,000 psi for each size.

The top-guided disc piston with its two-point bearing surface is completely free acting. Both bottom inlet and side outlet connections are tapped directly in the valve body. High carbon steel loading spring is completely enclosed.

Heat Exchanger QB 232

Seven tube "Karbate" impervious graphite shell and tube heat exchangers for use under highly corrosive conditions are now available from National Carbon Co., Inc., in three standard sizes of 4'3", 7'3" and 10'3" length. All three units employ 1" I.D. x 1½" O.D. "Karbate" tubes in bundles encased in standard 6" I.D. steel pipe shells. The exchangers are identical in every respect except for pipe length and the number of "Karbate"



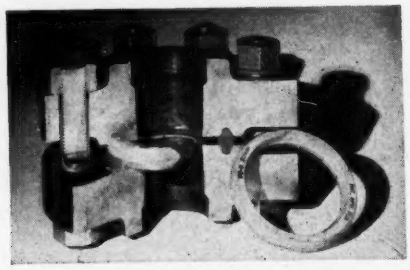
baffles, and all tube bundles and shells of the same size are interchangeable.

The units will carry temperatures up to 338° F. (170° C.) and a working pressure of 50 lbs./sq. in. on both the tube and shell sides. Standard nozzle connections permit ready installation with piping connections of almost any material of construction. Water, brine or steam are suitable on the shell side.

The 4'3" size has 8.2 sq. ft. of effective outside tube area, the 7'3" size 16.4 sq. ft. and the 10'3" size 24.6 sq. ft. The combination of tube sheet, dome and nozzle into one monolithic piece eliminates packed joints for the corrosive liquid and reduces the number of gasketed joints on the fluid side to one gasket at each nozzle.

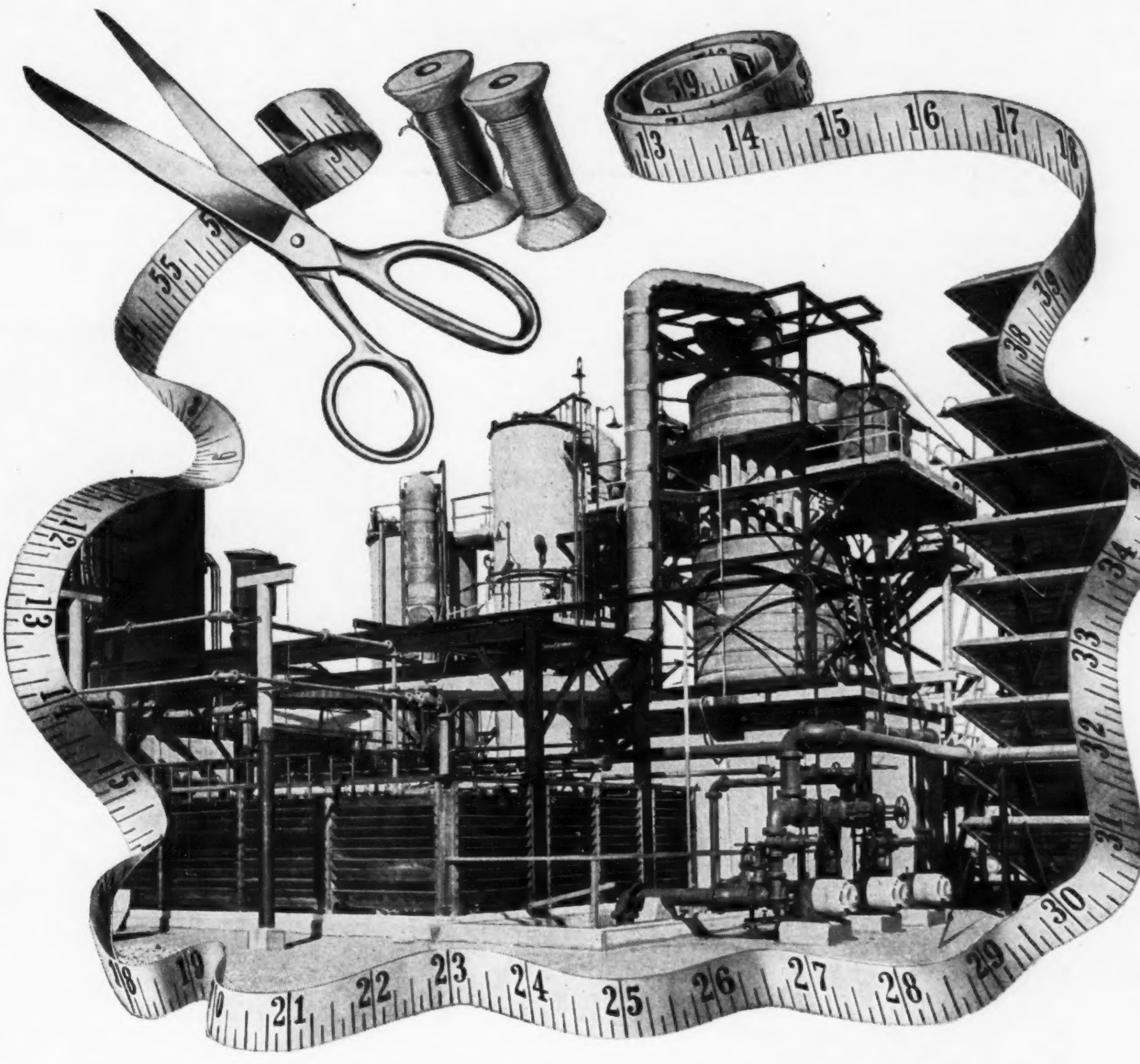
Fiberglas-Plastic Gasket QB 233

The new Fiberglas-plastic ring seal gasket of Plastic Engineering and Sales



Corp. is designed to reduce pipe line corrosion problems by providing insulation against the galvanic action of strong electrical currents.

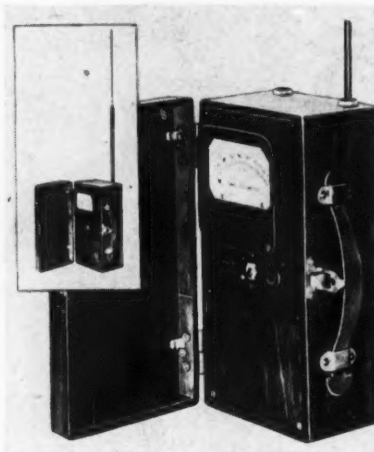
Micarta sleeves and washers are also used around to the flange bolts to pro-



vide electrical insulation for these members.

Static Electricity Detector QB 234

The new Statometer of Davis Emergency Equipment Co., Inc., calibrated in terms of static volts, can detect static charges of the order of fractional volts,

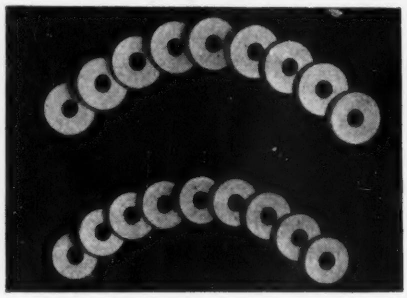


either negative or positive. It is possible to measure any voltage from 0 volts to 750 volts.

The operating switch is first turned on; the range switch is then turned to the low range position and balanced to zero. In the vicinity of a body charged with static electricity, the needle of the meter will start to fluctuate. The range switch is then turned to the high range position, the meter needle moving higher on the scale of the meter as the operator comes closer to the charged body. It is stated this same procedure is followed whether the static charge is negative or positive. True evaluation of the static charge up to 750 volts can be obtained.

Nylon Faucet Washers QB 235

Initial production of nylon faucet washers included only three standard sizes. However, Atlantic Plastics, Inc., have re-



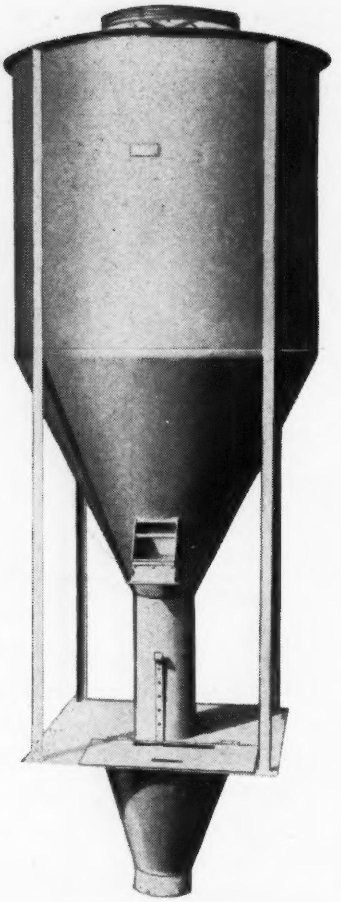
cently expanded their line to six faucet sizes and two special sizes for lawn sprinklers. Their production facilities can handle a maximum volume of 50,000,-000 washers per year.

These nylon washers are claimed to resist cold flow, are free from odor and taste, and unusually good resistance to chemicals and to changes in temperature.

Safety Goggle QB 236

The new all-plastic safety goggle of the American Optical Co., through its plastic frame and eyecups, affords an extremely wide angle of vision. The de-

sign of the eyecups plus the swivel center enables the goggles to conform very closely to the facial contours, relieving pressure on the bridge and distributing the light weight of the goggle.



THE STYLE V MIXER

AMERICA'S OUTSTANDING MIXING UNIT

Expertly designed and ruggedly constructed, the Sprout-Waldron Style V Mixer is a highly efficient mixing unit. Added to the Sprout-Waldron line of horizontal mixers, continuous mixers, and L. M. S. type vertical mixers, the Style V completes an outstanding line that includes the size and style mixer best suited to your needs.

With but one moving part—the vertical shaft of the mixing conveyor—maintenance and replacement costs in the Style V are negligible.

The design of this mixer makes it truly a "one man" unit. Common sense positioning of essential parts makes operation by only one man simple. A saving in manpower!

Look into the profit potential of the Sprout-Waldron Style V Mixer. Talk it over with your Sprout-Waldron representative. You may realize considerable savings.

Buy Sprout-Waldron for the finest processing equipment . . . . look to Sprout-Waldron for money-making advice.

SPROUT-WALDRON & CO.

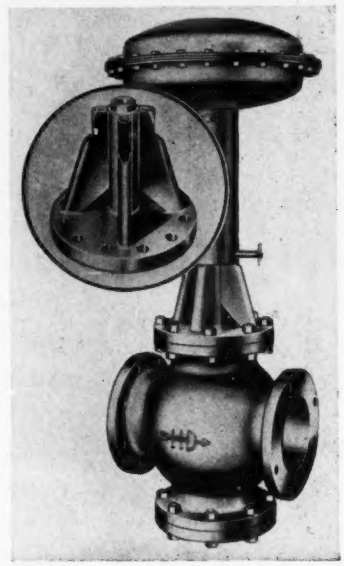
Manufacturing Engineers

MUNCY **PENNSYLVANIA**

Perforations at the top and bottom of the eyecups ventilate the goggle and reduce fogging. The swivel rod in the center of the goggles with a clamping nut at the top allows easy replacement of the lenses.

Vertical Fin Radiation Bonnet QB 237

Vertical "U" type fin radiation bonnets have been applied by Hammel-Dahl Co. to their complete line of diaphragm con-



trol valves in sizes 2" and larger. With the valve installed in the normal vertical position, the "U" section permits a natural draft or "chimney effect" which cools the packing box section of the valve when high temperature fluids are being handled.

Integral fabrication of the "U" fins with the forged bonnet provides the strongest possible structural support for the superstructure in comparison to the "wasp waist" construction generally employed.

Seamless Welding Fittings QB 238

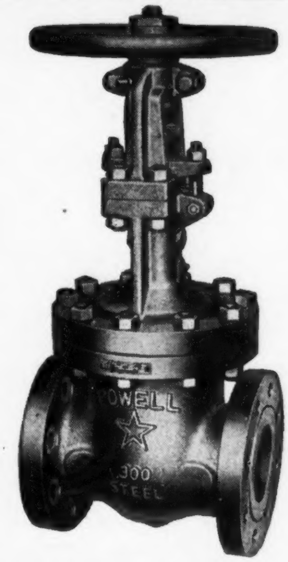
Ladish Co. have introduced a new line of seamless welding pipe fittings, consisting of 90° and 45° elbows, 180° return bends, straight and reducing tees, concentric and eccentric reducers, caps, lap joint stub ends, saddles, shaped nipples, crosses and tees in carbon steel, sizes up to 30 inches.

Water Fog Nozzle QB 239

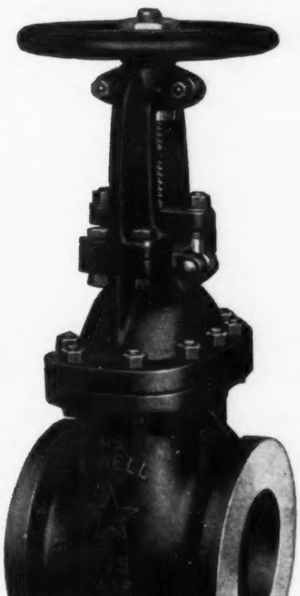
The new Underwriters' approved fire-fighting equipment of Bowser, Inc., connects directly to a water line. A swing joint mounting makes it possible for the fixture to turn in alignment with direction of the hose pull. A 50-ft. length of ¾" high pressure hose is racked in figure 8 position for fast removal without kinking.

The nozzle supplies finely atomized water (water fog) with pressures nor-

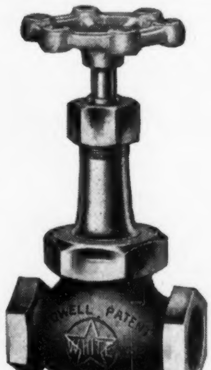
depends on *perfect* control.



Class 300-pound Cast Steel Gate Valve with bolted flanged yoke, outside screw rising stem and taper wedge solid disc. Powell Cast Steel Valves of all types are available in pressure classes from 150 to 2500 pounds, inclusive.



Large Iron Body Bronze Mounted Gate Valve for 125 pounds W.S.P. made in sizes 2" to 30", incl. Has flanged ends, outside screw rising stem, bolted flanged yoke and taper wedge solid disc. Taper wedge double discs can be provided in sizes 2" to 12", incl. Also available in All Iron for process lines.



Small size 200-pound Bronze Globe Valve for steam, water, oil or gas. For assured, long-life performance, it has a renewable, specially heat treated stainless steel seat and regrindable, renewable, wear-resisting "Powellium" nickel-bronze, plug type disc.

The performance of an orchestra depends on the control exercised by the conductor. Without this control, the greatest aggregation of musicians in the world would make a sorry mess of the finest symphony.

Likewise, the smooth performance of an industrial plant depends on the valves which control the media necessary to its operation. And for perfect performance in flow control, the valves must be adapted in every way to the conditions under which they operate.

For more than a century, Powell Engineers have been designing valves to meet every new flow control condition as it has arisen.

Today there's a Powell Valve, in Bronze, Iron, or Cast Steel, for every known requirement of Industry. And to meet the demands of the Chemical and Process Industries for corrosion-resistant valves, Powell makes a complete line, including many special designs, in the widest range of pure metals and alloys ever used in making valves.

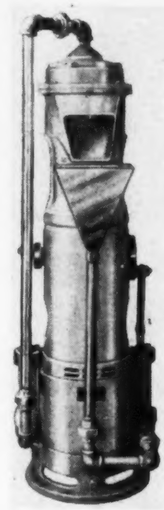
The Wm. Powell Company
Cincinnati 22, Ohio
DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

POWELL VALVES

mally provided by city water systems. Laboratory tests report a 20 ft. fog projection at 50 lbs. nozzle pressure with a gallonage discharge of 15.9 per minute. At 75 lbs. nozzle pressure, the projection is increased to 25 ft. with a gallonage discharge of 19.3 per minute.

Mill QB 240

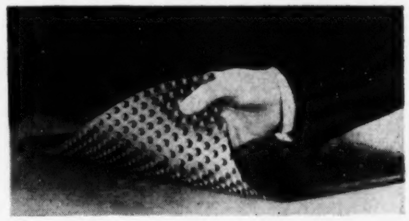
The new model Hy-R-Speed mill of Morehouse Industries, identified as Model SS-20, can be used for grinding, emulsifying, homogenizing, mixing, dispersing and disintegrating. Adjustment for various types of grinds and purposes can be made while the machine is in operation.



The new mill employs rotor and stator grinding stones, the former being driven at high speed by a 3600 RPM electric motor. A 6-spline coupling minimizes wear and vibration. All parts that come in contact with the product are of stainless steel. They are readily accessible to facilitate cleaning and quick change-over from one material to another.

Rubber Mat QB 241

A new design platform rubber mat, in which the outstanding feature is a pebbled design on the back, which pillars the mat ⅛ inch above the floor on the new platform rubber mat of the B. F. Goodrich Co., Akron, Ohio. Top design is corrugated or pyramid. The mats are made in black and brick red, in sizes ranging from 24″ by 24″ to those 72″ wide and 14′ long.



Lift Trucks QB 242

Lewis-Shepard Products, Inc., will furnish either plastic or metal wheels on their 1,000-6,000 lb. hydraulic pallet lift trucks.

PACKAGING & SHIPPING

by T. PAT CALLAHAN

1945 Truck Accidents Reported by ICC

On March 6, 1947, the Interstate Commerce Commission released to the public a report entitled "Motor Carrier Fire Accidents 1945." This analysis comprises 486 accidents involving fire in transportation as reported during the calendar year 1945. As many shippers of chemicals are faced with the problem of safety in the shipment of inflammable materials, we feel that this is a very pertinent report.

As an example of the type of information furnished in this report, it is noted that during this period there were 41 accidents involving propery-carrying vehicles in which combustibles other than petroleum were the cause of the fire. These 41 accidents contributed to a property damage loss of $297,233 or an average of $7,250 loss per accident. We believe careful attention should be given to the proper type of container and other factors involving transportation of inflammable and combustible materials via trucks, so that life and property may be protected by careful attention to all safety details.

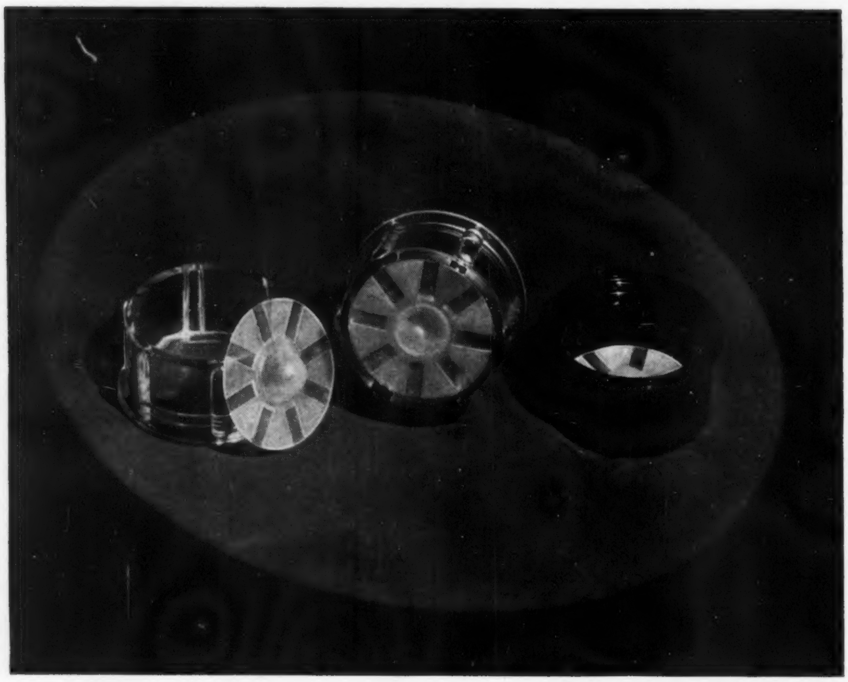
This report, as stated above, was issued by the Interstate Commerce Commission, Bureau of Motor Carriers, Section of Safety, Washington, D. C.

Single-Trip Drum Reuse Still Necessary

Steel drums continue in short supply and the immediate outlook is not very encouraging. Reuse of steel drums is still very necessary and particular attention should be paid to the inspection of these drums. Various occurrences of failures have been reported by the transportation agencies. So that these failures may be kept to a minimum we quote the ICC regulation covering permission to reuse single trip drums for dangerous commodities.

"(h) Single-trip containers made under specifications prescribed herein, from which contents have once been removed following use for shipment of any article, must not be again used as shipping containers for explosives, inflammable liquids, inflammable solids, oxidizing materials, corrosive liquids, or poisons, class B or C, as defined herein; provided that during the present emergency and until further order of the Commission, single-trip containers may be reused if retested and approved for service by the Bureau of Explosives. Applications for permission for reuse should be made to the Bureau of Explosives, 30 Vesey Street, New York City."

Plastic Carboy Closure



This is the polystyrene closure and new-type polyethylene liner which Owens-Illinois Glass Co. has developed for acid carboys. The new liner, superior to the type formerly used, consists of eight radial spokes and a bump in the center which insures that the liner will be inserted correctly in the closure. The new cap meets all Interstate Commerce Commission requirements. It has been designed to vent at pressures not exceeding ten pounds per square inch. In general, it has been used successfully on sulphuric, hydrochloric and nitric acids, hydrogen peroxide up to 35 per cent, and sodium hypochlorite.

Package Information from U. S. Dept. of Commerce

We should like to emphasize a useful Reference Service offered by the U. S. Department of Commerce entitled, "Packaging and Shipping Containers (Basic Information Sources)" compiled by the General Production Division of the Office of Domestic Commerce. This booklet lists available pamphlets dealing with all forms of containers and information as to where pamphlets can be procured. As an example, this booklet lists information on modern export packing, packing for domestic shipments, preparing shipments to various countries, booklets issued by other than Government agencies, and any other references as to where valuable information on packaging can be procured.

This booklet is procurable from the Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D. C., and is recommended as a valuable reference in the procuring of the many pamphlets, magazines, and books which have been written on packaging.

Acetylene and Ammonia Safety Manuals

The Manufacturing Chemists' Association has recently announced the publication of Chemical Safety Data Sheets SD-7, on Acetylene, and SD-8, on Anhydrous Ammonia, the seventh and eighth in the series of its chemical product safety manuals. Designed for supervisory staffs and management, the manuals concisely present essential information for the safe handling and use of chemical products.

Copies of the Chemical Safety Data Sheets may be procured at the following prices:

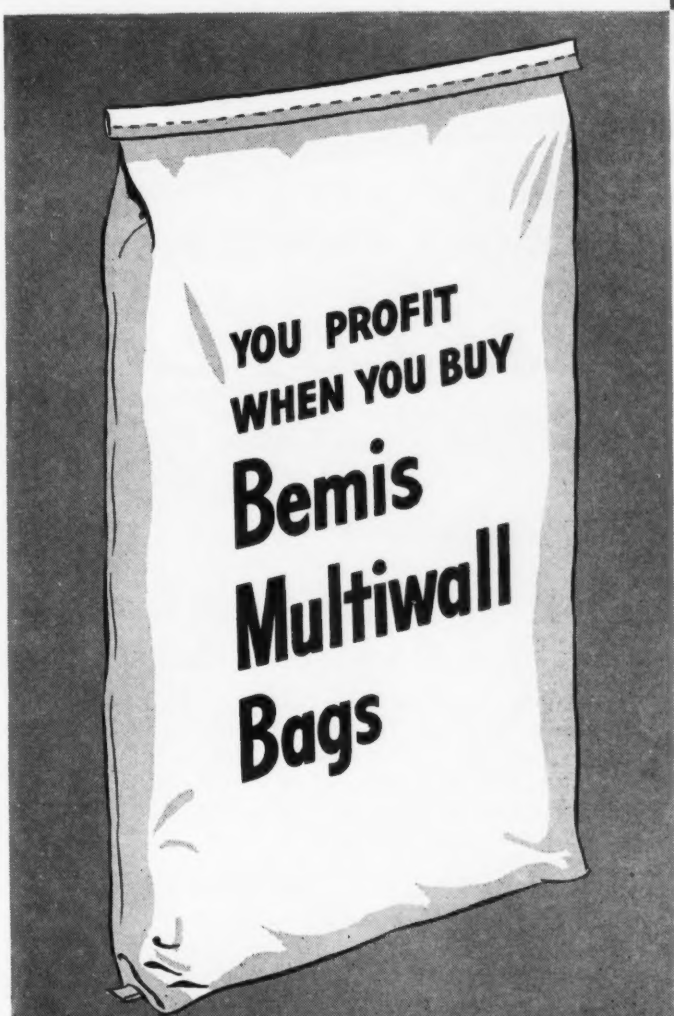
CSDS SD-7—Acetylene 15 cents per copy
CSDS SD-8—Anhydrous Ammonia 20 cents per copy

from the Manufacturing Chemists' Association, 608 Woodward Bldg., Washington 5, D. C. Send remittance with orders.

Fiber Drum Makers Meet

The annual meeting of the Fibre Drum Manufacturers Association was held at Hotel Adelphia, Philadelphia, last month. The agenda was arranged to permit adjournment at noon on the third day to

Are you getting the advantages of BEMIS MULTIWALL SERVICE?



What Bemis facilities can do for you in service is as important as the top quality you get in Bemis Multiwall Bags.

Bemis' plants and sales offices are located to give you close-to-source contact.

Bemis multiwall specialists are available to help you with plant layout and bag filling, closing, and storage problems.

That's why it's good business to have "The Bemis Habit."

BEMIS BRO. BAG CO.

Peoria, Ill. • East Pepperell, Mass. • Mobile, Ala.
San Francisco, Calif. • Wilmington, Calif. • St. Helens, Ore.

Baltimore • Boise • Boston • Brooklyn • Buffalo • Charlotte
Chicago • Denver • Detroit • Houston • Indianapolis
Kansas City • Los Angeles • Louisville • Memphis • Norfolk
Minneapolis • New Orleans • New York City • Orlando
Oklahoma City • Omaha • Pittsburgh • St. Louis • Salina
Salt Lake City • Seattle • Wichita

enable members to visit the Sixteenth Annual Packaging Exposition at Convention Hall, sponsored by the American Management Association.

Officers were elected for one-year terms: President, H. L. Carpenter, Carpenter Container Corp., Brooklyn, N. Y.; vice-president, W. J. Mahoney, The Master Package Corp., Owen, Wisconsin; treasurer, R. C. Carlson, Emery-Carpenter Container Co., Cincinnati, Ohio. Directors were elected for three-year terms: R. C. Carlson, Cincinnati, Ohio; and R. F. Gumbert, Plyfiber Container Corp., Garwood, N. J. Glenn Mather, Paper Division, Continental Can Co., New York, was appointed to continue as secretary; and R. E. Canfield, New York, is legal counsel.

H. A. Bergstrom, chairman of the A. S. T. M. Shipping Container Sub-Committee on Fibre Drums, Fibre Tubes and Plywood Drums, gave a comprehensive report on several testing methods now under consideration. Some of these testing methods were originally drafted for boxes and are being rewritten with appropriate changes for drums. Mr. Bergstrom, who is chief chemist for the Container Co., Division of Continental Can Co., Inc., asked for a vote by the Association on certain alternate methods. Drop, compression and water vapor-permeability tests were almost universally favored. Shower tests for various durations were considered by the fibre drum manufacturers to be a more accurate measure of protection for overseas shipments than immersion tests.

Another subject of great interest considered at the Philadelphia meeting was the new fibre drum specifications prepared by the Army and Navy Committee in 1945 and 1946 but not yet issued. Additional revisions are being recommended by the drum manufacturers so that bidders on government orders will not be limited to one or two suppliers. The discussion was led by President Carpenter and by C. E. Eggerss, Chairman of the Transportation Committee, who also reported on developments in the use of fibre drums for air freight and express.

Mr. H. M. Walter reported on plans for developing a bulletin or poster featuring recommendations for best handling practices and loading of fibre drums; and Vice-President Mahoney reported on palletizing and other developments which should increase the future market for fibre drums.

President Carpenter summarized the fibre drums industry's status in part as follows:

"The continued shortage of paperboard, steel and lumber is unquestionably our most serious problem today. Production has been limited and in some factories completely stopped for several months by the inability of the drum manufacturers to secure adequate amounts of these important raw materials. Every member of our industry reports having enough labor, and could give employment to more men and women, if raw materials were available.

"The demand for fibre drums in which to ship essential commodities has been expanding in the last eighteen months—even more than we had expected. If the raw material situation will ease somewhat, the production of fibre drums in 1947 will be about twelve times greater than in 1940. The current increased use of special linings and treatments for the protection of sensitive . . . products is . . . contributing to a wider appreciation of the unusual protection afforded by these . . . containers, built to meet the special requirements of each commodity. . . . I am optimistic about the sound growth of the fibre drum industry and the long-range picture."

*Eliminating Damage Claims Through Proper Carloading**

If one fully understands the principles of packing an article within a shipping container — namely, the article must be stayed against moving about within the container either by means of rigid blocking or its movement restricted by means of some cushioning or shock absorbing material—little difficulty should be experienced in the loading and bracing of shipments in or on a freight car. A freight

* Excerpts from an address by A. P. Kivlin, Assistant Superintendent, Freight Claim Prevention, The New York, New Haven & Hartford Railroad Company, Boston, Mass., delivered before the Packaging Conference of the American Management Association, Convention Hall, Philadelphia, April 8-11, 1947.


Continental serves
behind the scenes
—behind the
labels of America's
finest products

car can, for all intents and purposes, be considered a supershipping container mounted on wheels.

Most damage in carload shipments is the result of the lading shifting in the car. Shifting is permitted by allowing unoccupied space to exist in the car into which the lading can shift. This unoccupied space is either the result of the lading or the lading and supplementary blocking in the car not fully occupying the entire floor area, or else the lading compresses in transit by normal or exceptional impacts that permits space to be created that will allow the shifting of the lading. One contribution to the creation of unoccupied space is the failure of the bracing or bulkheading, which may result from one of two causes:

1. Poorly designed or improperly applied blocking or bracing, or blocking and bracing made of insufficient or defective material.
2. Blocking or bracing failures, in certain instances, that are due to exceptional handling to which the car might be subjected in transit.

Most damaging shocks to which the lading in the car will be subjected to while in transit will be lengthwise of the car. The transmission of these damaging impacts may be minimized by the use of effective draw bars which are provided with efficient springs.

The lading is also subjected to shocks of a lesser degree as result of vertical vibration. It is the principle cause of lading in the car creeping or walking lengthwise or crosswise of the car which creates a void into which the lading can shift with resulting damage. Every effort should be made in loading and staying freight to counteract this movement of lading which results from vertical vibration.

The third type of damage is caused by the side sway of the car. It is thought that damage to lading resulting from this side swaying is of minor importance insofar as damage is concerned.

To correct this situation it is proposed that fibreboard container manufacturers and the carriers, through their joint efforts, develop by test shipments and impact tests, facts upon which they might base the number of compartments into which the car should be divided by bulkheads crosswise of the car. The number of containers in each of these compartments is thus restricted so that the mass in each compartment is not sufficient to compress the stacks to such an extent as to permit a void that would allow a damaging shift. It is further thought if such a study was developed that few compartments would be required to obtain the desired results.

At the present time it is a general practice and it has been recommended from authoritative sources that fibreboard containers be loaded lengthwise of the car. We believe this practice is conducive to damage. When containers are loaded

lengthwise in the car the following situation exists: the long sides of the containers do not have the strength to resist compression that the shorter ends have if the containers are loaded crosswise. This is a simple mechanical principle which has been overlooked by carloading authorities, who should appreciate that a long column of the same cross sectional area has a greater tendency to bow or flex out of alignment than a shorter column of the same cross sectional area. This bowing or flexing causes an excessive amount of slack to be created lengthwise of the car which in turn causes the sides of the container to become creased and permits damaging forces to be transmitted directly to the contents of the container. This flexing of the sides of the containers also causes the covers to spring open due to the excessive strain set up in the adhesive used for attaching the outer flaps to the inner flaps. When the containers are loaded lengthwise in the car the inner flaps serve no useful purpose for reinforcing the compression of the containers whereas if the containers were loaded crosswise in the car these inner flaps would immediately come into compression and resist the compression forces which would tend to buckle or crush the containers.

The subject of loading and staying of freight could not be considered complete unless some mention is made relative to the "Flexible Method" of loading in which the lading is prepared as a full floating unit or a semi-floating unit where the shifting of the unit is restricted by some type of a retarder.

In the floating or "Flexible Method" of loading freight in cars the same principle applies as in the rigid brace method: Each floating unit, comprised of several smaller units, should be assembled in the main unit in an orderly manner and then securely bound together as one unit, appreciating the fact that the entire unit is no stronger than the weakest unit in the assembly; and that when this weaker unit collapses, the entire unit has lost its full effectiveness and will have a tendency to disintegrate and become disorganized with resulting damage. It is, therefore, important that each container comprising the floating unit should be carefully examined prior to its being loaded and braced in the car.

Under present day handling it may be found necessary to use retarders on shipments which were formerly shipped under the full unrestricted floating unit; especially so if more than one unit is loaded into the car.

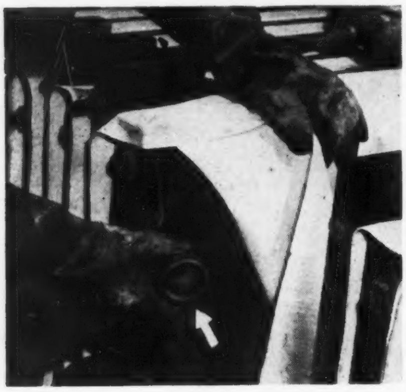
Col. Edwin L. Hobson, Monsanto Chemical Co., N. Y., has been appointed chairman of the Packaging Institute's Technical Committee, whose concern is the interchange of technical information among manufacturers and users of packaging materials.

PLANT OPERATIONS NOTEBOOOK

As long as the supply lasts readers may obtain copies of "A. S. M E. Standard Automatic Control Terminology", reprinted from the last few issues of Chemical Industries.

Cutting Holes in Filter Cloth

The use of a knife for cutting holes in filter cloth is both cumbersome and dangerous. Acting on the suggestion of Edward C. Williams, Naphthalene Purification Operator at the Chambers Works of E. I. Dupont de Nemours and Co., special dies have been made for this operation, greatly simplifying and increasing the safety of the procedure.



One of the dies is indicated by the arrow in the photograph above, just as it is inserted into the press plate.

After the die has been inserted into the hole the cloth is drawn taut across the die. A sharp rap with a wooden mallet produces a clean hole as the sharp edges of the die cut through the cloth.

Clean Air

The removal of dusts is the subject of the latest pamphlet released by the Division of Labor Standards of the U. S. Department of Labor in its Controlling Chemical Hazards series.

In addition to a discussion of the physiological reactions to dusty atmospheres, the pamphlet contains many suggestions on types of exhaust systems, and a bibliography covering data on the design, construction and operation of dust removal systems.

Limited numbers can be obtained from the Division, larger orders from the Superintendent of Documents, Government Printing Office, Washington 25, D.C. at 10c per copy (25% discount on all orders over 100). Remittance should accompany all orders.

Eye Accidents

Studies by the National Society for the Prevention of Blindness indicate the following causes for eye accidents:

80% by flying particles
8% by tools or machinery
7% by splashing liquids
2.5% by explosions
2% by falls
0.5% by infection

Blindness has been produced in 8,000 persons by these causes and over 80,000 persons have lost the sight of one eye. Over 2,000 persons will be blinded in one or both eyes this year by occupational hazards.

Plastic Tubes Reduce Plating Bath Spray

Chrome-Lock tubes, a product of the Udylite Corp., Detroit, Mich., are extruded tubes of acid-resistant Styron (Dow polystyrene), cut in 3" lengths and closed at each end.

A sufficient depth of them floating on chrome plating solutions blankets the bath

and markedly reduces the quantity of chromic acid fumes formed, at the same time reducing the quantity of acid lost through the ventilating system.

The tubes (see below) completely cover the acid bath and readily move apart when a plating rack must be moved.

NOMOGRAPH-OF-THE-MONTH **Edited by DALE S. DAVIS**

Determination of Sulphur Dioxide By The Reich Test

by O. T. FASULLO
Consolidated Chemical Ind., Inc. Houston, Texas

CHEMICAL INDUSTRIES *will be happy to receive any charts which you may have developed so that they may be shared with your fellow engineers. The authors of each chart published will receive an honorarium of $10.*

IN THE manufacture of sulfuric acid by the contact process, it is very important to know the sulphur dioxide concentration of the burner gas entering and leaving the converter so that the percentage conversion of sulphur dioxide to sulphur trioxide can be determined. The percentage of sulphur dioxide is determined by the Reich's Test and a nomograph was constructed using the equation,

$$\%\ SO_2 = \frac{1094.4}{C\left(\frac{760 - W}{(1 + .00366t)\ 760}\right)} + 10.944$$

so that the percentage of sulphur dioxide could be quickly determined by knowing the temperature, t, and the volume of gas aspirated, C.

The Reich's Test consists of aspirating the gas through a measured quantity of

iodine until the sulphur dioxide is removed by being oxidized to sulphuric acid, and the iodine is converted to hydiodic acid. Starch is used as the indicator for this reaction. The reaction takes place as follows:

$$2I + SO_2 + 2H_2O \longrightarrow 2HI + H_2SO_4$$

After removal of the sulphur dioxide, the aspirated gas is measured in a graduated cylinder or buret. Since the total volume of gas analyzed is equal to the buret reading plus the sulphur dioxide removed, and since the volume of sulphur dioxide removed can be determined from the amount of iodine used, the percentage of sulphur dioxide can be easily calculated.

The equation for % SO_2 will be derived by determining the sulphur dioxide in the burner gas entering the converter when 10 cc. of 0.1*N*. iodine are used. At 0° C and a barometric pressure of 760 mm., one cc. of sulphur dioxide weighs 0.0029266 grams. Ten cc. of 0.1*N*. iodine solution is equivalent to 0.03203 grams or 10.944 cc. of sulphur dioxide gas at standard conditions.

Let C = cc. of water aspirated, which is equivalent to the volume of gas after the SO_2 has been removed.

W = Aqueous vapor tension

t = Temperature of water in degrees Centigrade.

Then

$$\% \ SO_2 = \frac{10.944 \times 100}{C\left(\frac{(273)}{(273+t)}\ \frac{(760-W)}{760}\right) + 10.944}$$

Simplifying

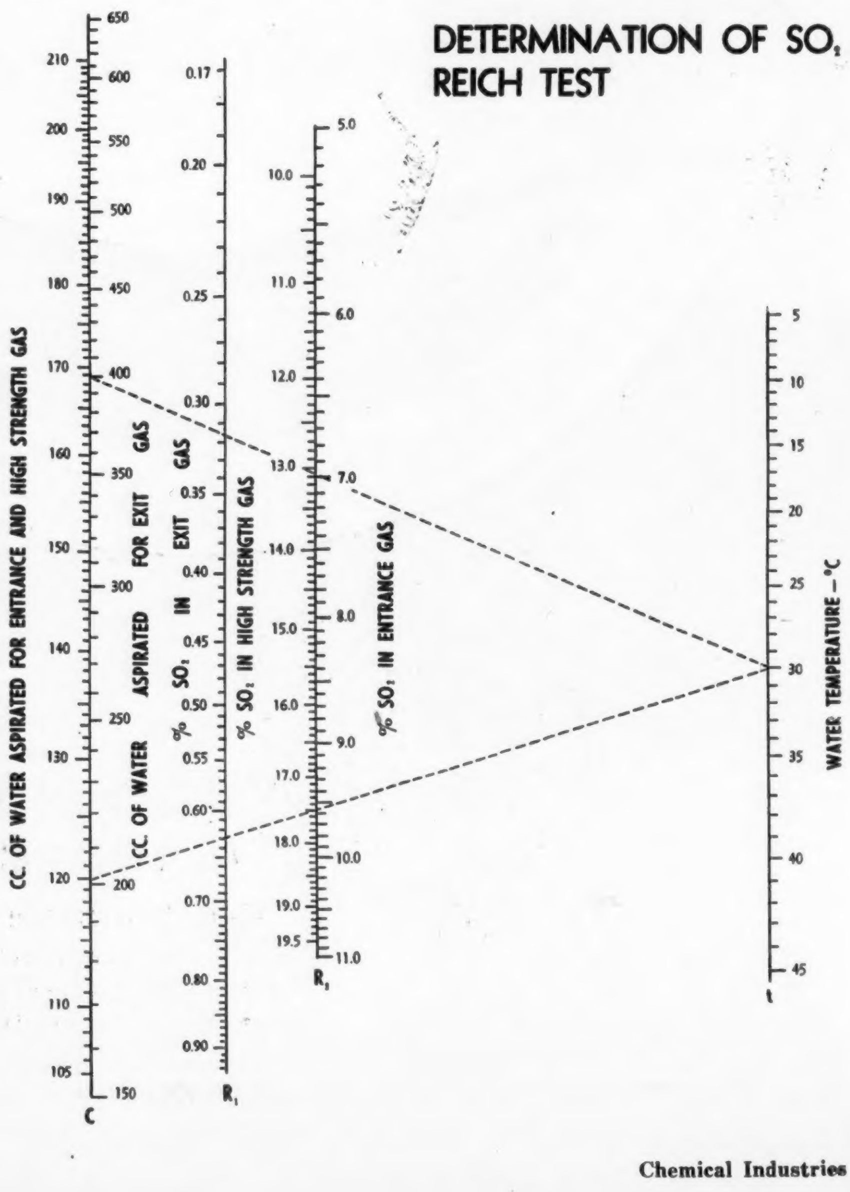
$$\% \ SO_2 = \frac{1094.4}{C\left(\frac{760-W}{1+.00366t)\ 760}\right) + 10.944} \quad (1)$$

For high strength burner gas, when the sulphur dioxide ranges from 10% to 19.5%, 20 cc. of 0.1*N*, iodine are used and the equation becomes

$$\% \ SO_2 = \frac{2188.8}{C\left(\frac{760-W}{1+.00366t)\ 760}\right) + 21.888} \quad (2)$$

For the exit gas leaving the converter when the sulphur dioxide ranges from 0.17% to 0.90%, 10 cc. of 0.01*N*. iodine are used and the equation becomes

DETERMINATION OF SO_2 REICH TEST



$$\% \; SO_2 = \frac{109.44}{C\left(\frac{760 - W}{1 + .00366t)\ 760}\right) + 1.0944} \quad (3)$$

To illustrate how the nomograph was constructed, equation (1) will be used.

$$\text{Let } K = \frac{760 - W}{(1 + .00366t)\ 760}$$

and the equation becomes

$$\% \; SO_2 = \frac{1094.4}{CK + 10.944}$$

and rearranging we have

$$CK = \left(\frac{1094.4}{\% SO_2} - 10.944\right)$$

Solving for various percentages of SO_2, we have

$$\begin{aligned} &\text{at } 6.0\% \; SO_2,\ CK = 171.456 \\ &\text{at } 8.0\% \; SO_2,\ CK = 125.846 \\ &\text{at } 10.0\% \; SO_2,\ CK = 98.496 \end{aligned}$$

The value of the constant K depends upon the temperature and the corresponding vapor pressure of water. Solving K for a few values of temperature, we have

at 20° C, W = 17.535 mm., K = 0.9103
at 30° C, W = 31.824 mm., K = 0.8633
at 40° C, W = 55.324 mm., K = 0.8088

Since both the temperature and the $\% SO_2$ can be plotted as numerical values, the chart becomes a simple multiplication operation.

Equations (1), (2), and (3) are all included in the enclosed nomograph. On the C axis, the volume of water aspirated for entrance and high strength gas is plotted on the left side and the volume of water aspirated for exit gas is plotted on the right side. On the t axis, the temperature is plotted as a function of the numerical value of K. Two resultant axes are shown; R_1, which shows the % SO_2 in exit gas using 10 cc. of 0.01 *N* iodine solution, and R_2, which shows the % SO_2 in high strength gas using 20 cc. of 0.1 *N* iodine on its left side and the % SO_2 in entrance gas using 10 cc. of 0.1 *N* iodine on its right side.

Examples showing the use of the chart are illustrated by dotted lines,

(1) If 120 cc. of water were aspirated at a temperature of 30° C using 10 cc. of 0.1 *N* iodine, the % SO_2 in the entrance gas would be 9.56%.

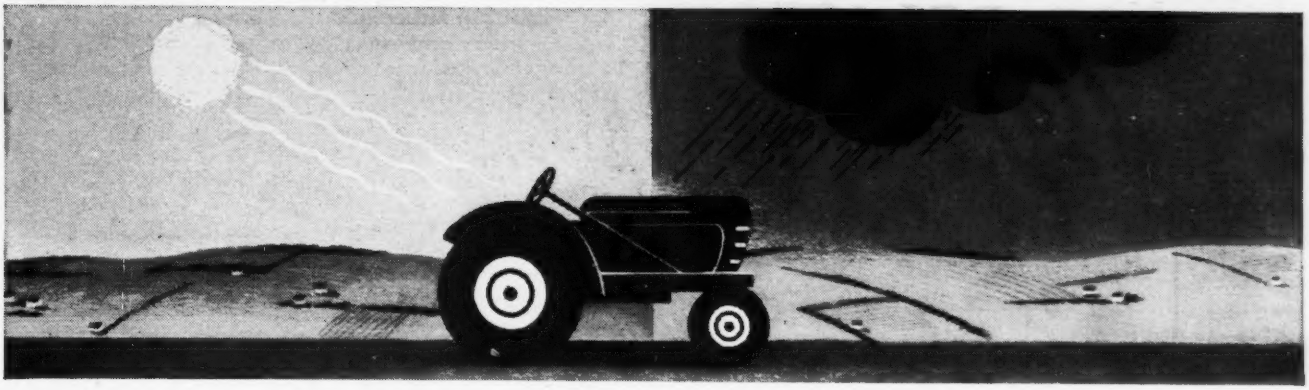
(2) If 20 cc. of 0.1 *N* iodine were used in the case above, the % SO_2 in the high strength gas would be 17.49%.

(3) If 400 cc. of water were aspirated at a temperature of 30° C using 10 cc. of 0.01 *N* iodine, the % SO_2 in the exit gas would be 0.317%.

This nomograph has many advantages over the tabulated results that appear in handbooks. It is fast and accurate and can be used without interpolation.

References

Sullivan, T. J.—Sulphuric Acid Handbook New York—McGraw-Hill Book Co.—1918



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LABOR RELATIONS

by NATHAN C. ROCKWOOD

Portal to Portal Developments

Although relative quiet has settled over the discussion of the "portal to portal pay" issue, interesting developments are in progress.

THE popular phrase "portal to portal pay" is something of a misnomer, for the genuine portal to portal pay issue, decided in 1944 by the U. S. Supreme Court in the case of the Tennessee coal miners, has never been questioned; and the miners, there and elsewhere, are collecting pay for the time they spend getting ready for work, traveling portal to portal to the working breast and back again while they are in the mines.

It was the attempt of workers in ground level plants to extend the pay work day to include similar preparation and travel time that brought about the U. S. Supreme Court decision in the Mt. Clemens Pottery Co. case, with the resulting avalanche of C. I. O. suits, totaling, it is said, some four or five billion dollars in claims for back wages with penalties. In these suits the C. I. O. exhibited extremely poor strategy, to say the least, for its leaders could have done nothing more to arouse the people of the country against organized labor at a time when revisions of the laws are under consideration. The A. F. of L., with more wisdom and experience, took the position that such extra pay should be a matter for collective bargaining.

Back to Supreme Court

The U. S. District Court at Detroit, Mich., to which the Mt. Clemens case was remanded by the U. S. Supreme Court, heard arguments not only of the company's and the union's counsel, but also those of three "friends of the court," that is, the U. S. Department of Justice, the National Association of Manufacturers and the C. I. O. The case was remanded not on points of law, but to determine just how much compensable time was involved; and if the trial court found this to be trivial (the de minimis rule) the courts were not to be concerned about the case at all. The District Court judge, after personal investigation of the conditions at the Mt. Clemens plant, decided the time involved in dispute was less than 12 minutes a day, and therefore trivial.

The issue is now back on the docket of the U. S. Supreme Court to decide whether 12 minutes or less per day is substantial enough to require a back-pay adjustment. The District Court also raises the point that if the 12 minutes should be considered compensable working time, have the employees any claim beyond the time when the U. S. Supreme Court first decided that the time spent on the plant premises preparing for work is compensable.

Actual Walking Time

Whichever way the high court decides this case, and regardless of any new legislation by Congress to clarify the issue, there will be new collective contracts written, and this issue will have to be settled there; for it is doubtful if Congress can or even wishes to outlaw so-called portal to portal pay as a matter of consideration for collective bargaining. The fact is that some employers have already made contracts to include preparation time as compensable, and at least two employers we know of have made retroactive compensation terms. The A. F. of L. took the wiser course from the angle of getting some long-time benefit for their members, as well as the fairer course so far as employers are concerned.

Standard Oil Co. (N. J.)

Some employers have already made contracts to include preparation time as compensable.

Therefore, the decision of the U. S. District Court at Detroit in this second hearing of the Mt. Clemens case is worth study because it was a scientific and judicial attempt to find out the true amount of time that employees claimed to have spent in necessary preparation for their daily tasks. Whether the exact time that should be allowed as compensable in this particular case is determined by the U. S. Supreme Court or not, it will be something that must be determined and agreed upon if the matter is settled by collective bargaining contracts.

The judge at Detroit gave an historical summary of the case in which he made these points: that it was the defendant company itself that injected the "portal to portal" issue, by explaining too enthusiastically why its employees reported 14 minutes ahead of time; that seemingly the employees spent 25 to 30 minutes a day, which was not paid for, but appeared at the time of the original trial to be compensable time.

The Supreme Court in remanding the case implied instructions to the lower court to determine (1) how much walking time was involved in going from the time clock to the several respective work places; and (2) the time necessarily consumed in putting on overalls, aprons, removing shirts, taping or greasing arms, putting on finger cots, preparing equipment, etc. The Supreme Court also included two mandates: (1) that after such information was obtained the District Court must, in computing damages (back wages and penalties), apply the rule of "de minimis non curat lex" (the law cares not for small things); and (2) that the rule must be applied to a work week contemplated by Section 7 (A) of the F. L. S. A. (the wage and hour law), "in the light of the realities of industry."

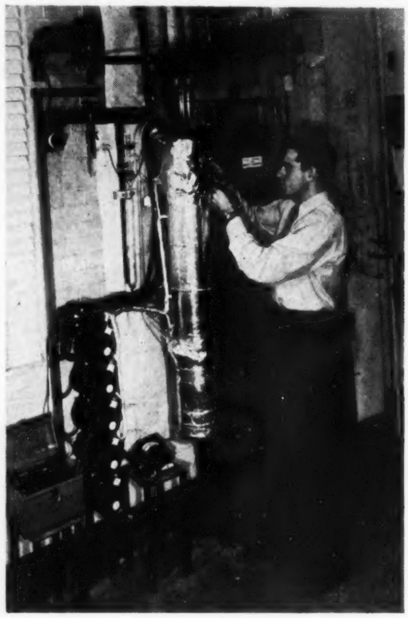
Under these instructions, or the court's undertaking of them, it could not consider time spent on the company's property other than that spent in walking from the time clock to the job locations and the preparations for work mentioned above. To determine the facts in the case, the distances from the time clock to all the work benches, etc., were measured, and by actual experiment the time spent walking was determined. This tabulation may prove as helpful as the decision itself in combating similar claims elsewhere, because it proves the employees' estimates of time so spent were grossly exaggerated, as they are likely to be under similar circumstances. We don't list the whole tabulation, but here is a sample: "That at the rate of 2 miles per hour a man walks 2.93 ft. per second or 176 ft. per minute." The distance from the time clock to the farthest job site was 890 ft. by the longest way around, or 5 minutes walking time by the slowest man on the job.

In the same way the other preparatory motions at the job site were studied, and hence the "less than 12 minutes" a day arrived at, since these preliminary activities were found to total less than 3 minutes a day. Many of the activities listed in the original petition of the employees were indulged in by only a few. The court was unable to find any clue in previous decisions of the Supreme Court as to the limits of de minimis, so drew its own conclusion with the understanding that the Supreme Court would pass on this determination.

LABORATORY NOTEBOOK

New Distilling Column

A new rotary concentric-tube distilling column, having a very high efficiency factor for fractional distillation, has been developed. It is designed to improve separating efficiency by increasing the diffusion rate of the molecules in the gas phase. This is accomplished by forcing the gas into turbulence through rotation of the inner closed cylinder in a concentric-tube rectifying section.



The apparatus consists of three parts—the Pyrex head, steel rectifying section, and Pyrex pot. All three sections are provided with external heating elements and copper-constantan thermocouples for temperature regulation.

For high values of throughput—two to four liters of liquid per hour—this distillation column, when operated at 4000 rpm, has an efficiency factor about ten times those previously reported for other rectifying columns. It also has low values of pressure drop per unit throughput, which may be advantageous for distillations at low pressure. Shown above is a laboratory worker removing distillate from the apparatus. The rotary concentric-tube distilling column was developed at The National Bureau of Standards, Washington 25, D. C.

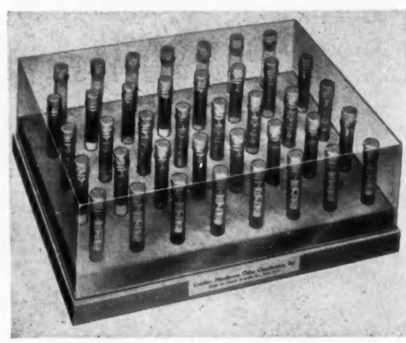
Anti-Creep Reagent For Filtering

Ashless Anti-Creep Fluid is a new reagent which prevents the "creep" of precipitates on filter paper and facilitates the transfer of insolubles from the precipitation vessel. When a few drops (1 ml.) of Anti-Creep are added to 500 ml. of wash water, on the basis of 100 ml. solution used per analysis only .05 mg. of non-volatile matter is introduced into the filtrate—a quantity negligible in most analyses. It is particularly useful in the filtration of ammonium phosphomolybdate, tungstic acid and heavy metal sulfides. Available in 100 ml. amber high resistance glass bottles at $2.00 each from Schleicher & Schuell Co., 116 W. 14th St., N. Y.

Odor Classifications

A system for the classification of odors according to the intensities of four odor "components" which have been termed fragrant, acid, burnt and caprylic (goat-like) has been devised and equipment is now on the market. The Crocker-Henderson Odor Standards offer a means of specifying the odor of any material in terms of a 4-digit number.

The 32 permanent standards come in vials which are set in a wooden block with a transparent plastic cover. Using these, a laboratory worker with a little experience can evaluate an odor in a few minutes. Several thousand combinations of the four components—eight intensities of each—make it possible to assign a specific number to any odor. There are definite ranges of Crocker-Henderson



odor numbers for such "characteristic" odors as fishy, rancid, fetid, tarry, oriental, and flowery. Such numerical relations indicate clearly odor values and may be checked by workers in different locations.

Among the applications of this system of odor analysis are the control of odors of raw materials and finished products in such fields as foods, beverages, soaps and cosmetics, pharmaceuticals, textiles, leather, rubber, plastics, naval stores, synthetic resins, paints and varnishes, petroleum products. The equipment is available from Cargille Scientific Inc., 118 Liberty Street, New York 6, N. Y.

INDUSTRY'S BOOKSHELF

Heterocyclic Compounds

THE CHEMISTRY OF HETEROCYCLIC COMPOUNDS, *by Avery A. Morton, Professor of Organic Chemistry, Massachusetts Institute of Technology.* McGraw-Hill Book Company, Inc., New York City, 1943; vii + 549 pp., $6.00. Reviewed by Ed. F. Degering, Professor of Organic Chemistry, Purdue University.

"THE COMPILATION of a text of this type," according to the author, "presents several problems. For example, the representation of the various steps in the synthesis of many compounds might give the appearance of a book of formulas if one diagram were allotted to each step. Accordingly, the drawings have been limited, in general, to three or four key compounds, even though there may be as many as 10 or 20 steps from the simple to the known structures of the final product. . . . The details of the syntheses are; however, written in fine print. Large letters in the place of formulas also conserve space and focus attention on the heterocyclic chemistry of a synthesis."

The reviewer, for one, does not like the use by the publisher of large letters in lieu of formulas. The formulas could have been reduced 10%, in which case they would be perfectly legible and fit into the same space. Whereas this practice may focus attention on the heterocyclic chemistry, it is likely to introduce a confusion factor which more than offsets any advantage. The apparent lack of consideration of the rules of orientation for heterocyclic compounds is regrettable in a book of this type. It is hoped that both of these items, irrespective of the expense involved, will be given serious consideration before the next publication of the book.

The topics covered are best indicated by the chapter headings: the furan compounds (19 pages), condensed furan systems (19), thiophene and condensed thiophene systems (17), pyrroles (19), di- and poly-pyrryl compounds, porphyrins and phthalocyanins (25), condensed pyrrole systems (48), pyrans, pyrones, and related compounds (37), the pyridine group (24), piperidine and related compounds (33), the quinoline compounds (39), isoquinolines (25), acridines and other condensed compounds (36), azoles, azolones, and related systems, part I (56), the azoles, part II, compounds (58), the azines and related compounds (45), and index (28).

Over twenty-two hundred literature references are cited and a total of two hundred seventy-seven problems are included at the end of the various chapters. The book is well done and meets a distinct need, both as a text book and as a reference volume.

Chemical Statistics

CHEMICAL FACTS & FIGURES. Second Edition. Manufacturing Chemists Association of the United States, Washington, D. C., 1946. 401 pp.; $2.00.

WHEN the first edition of Chemical Facts & Figures appeared in 1940 it was welcomed throughout the industry as the first really comprehensive collection of statistical facts pertaining to the manufacture of chemicals in the United States.

Although this second edition has been a long time in coming because of wartime restrictions on information, most users will find that it has been well worth waiting for. Both the scope and usefulness of the book have been greatly expanded.

In general, the second edition takes up where the first left off and does not duplicate data published in the latter. Statistics are included for the period 1940 through 1945, with some data also for the first six months of 1946.

In addition to available production figures, the present volume gives data on research expenditures, wartime allocations and end-uses, employment and wages, prices, imports and exports, safety, shipping and container specifications, M.C.A. manuals, and Canadian chemical production.

Organic Analysis

A LABORATORY MANUAL OF QUALITATIVE ORGANIC ANALYSIS, *by H. T. Openshaw (University of Manchester).* Cambridge University Press, Cambridge, England, 1946. 95 pp.; price, 6 s. Reviewed by Nelson J. Leonard, University of Illinois.

A LOGICAL method for the identification of the most common types of organic compounds has been presented by the author of this laboratory manual. The general procedure described does not differ in principle from that found in the standard works on qualitative organic analysis, to which Dr. Openshaw makes acknowledgment. The usefulness of the present manual lies chiefly in its brevity, clarity, and logical arrangement.

Following a brief statement concerning the preliminary investigation of the physical properties of a substance, the author outlines the methods of detection of constituent elements and characteristic functional groups. There is very little information on the separation of mixtures. The methods of preparation of derivatives are described, and information concerning the physical properties of common organic compounds and their derivatives is incorporated in well-arranged tables. From these tables it can be determined very quickly whether a particular derivative has or has not been described in the literature, what method will serve for its preparation, whether by-products (also useful derivatives) are to be expected during its formation, and whether its physical properties are reliable.

Extremely useful bits of information are imparted unpretentiously by the author in describing such reactions as those between quinones and bisulfite, hydroquinone and ferric chloride, anthraquinones and sulfuric acid, nitro compounds and titanous sulfate, dinitrobenzoate esters and a-naphthylamine.

The chemist inexperienced in qualitative organic analysis will find this manual easy to follow. The experienced chemist will discover much valuable information in the author's well-organized presentation.

Silicone Review

AN INTRODUCTION TO THE CHEMISTRY OF THE SILICONES, *by Eugene G. Rochow.* John Wiley and Sons, Inc., New York, 1946. $2.75; 137 pp. Reviewed by E. L. Warrick, Mellon Institute.

FULFILLING its author's purpose admirably, this book is a survey of the knowledge in the field of organo-silicon chemistry which will be of service to engineers and designers who may desire to use these new materials. As a background for better understanding and useful application of the technical data now available on commercial products, it is an excellent primer. It is unfortunate that in such a rapidly advancing field as this, some of the remarks may be best considered only indicative and not conclusive.

For students of organo-silicon chemistry, this book represents a good beginning. Research workers in the field will find the book interesting as history but definitely not as a reference book. Such ambitious undertakings as a literature compilation or a reference text were clearly not Dr. Rochow's intention.

Greater detail in some sections might have been helpful, particularly to the engineers for whom the book was written. For example, engineers may find the section dealing with the comparative economics of two processes for the production of organo-silicon intermediates entirely lacking in data on which to base a selection. Indeed such data may only be obtained after considerable commercial experience has been achieved with both processes. This portion of the book seems beyond the scope of the purpose defined

by the author and beyond the scope of the data available.

Since Dr. Rochow clearly states that the book presents a point of view and not an uncritical compilation of published fact, specialists in the field of organo-silicon chemistry may differ with some of his conclusions and indeed with some of his omissions of literature. The rapid expansion of the field even in the period of writing and publishing such a book increases the number of these points of difference. Despite these difficulties the book is a careful survey of the field of organo-silicon chemistry and should be quite useful to engineers and designers.

Synthetic Food Adjuncts

SYNTHETIC FOOD ADJUNCTS, by *Morris B. Jacobs.* D. Van Nostrand Company, New York, 1947. 355 pp.; $5.50. Reviewed by Bernard L. Oser, Director, Food Research Laboratories, Inc.

THE USE of synthetic chemicals in the manufacture, processing, and packaging of foods has expanded so greatly since the turn of the century that it is not surprising to find a prolific writer like Dr. Jacobs coming forth with a convenient guide to the use of these compounds in the food and beverage industries.

The book is largely (215 pp.) devoted to the topic of synthetic flavoring materials; 48 pages are given over to synthetic colors; 44 pages to preservatives and stabilizers; and 21 pages to vitamins. Consideration might be given, in a later edition, to including a discussion of synthetic mineral nutrients employed as food adjuncts, such as sodium iron pyrophosphate, stabilized iodides, etc.

Properties are described of the various esters, ethers, alcohols, and other organic compounds which enter into compositions designed to imitate natural flavors. While writing his book, Dr. Jacobs must have prayed for a functional classification, on a quantitative as well as qualitative scale, of the organoleptic properties of these agents. The practical workers, when confronted with long lists of major or minor constitutents of a given flavor mixture, must usually resort to the empirical approach to problems of flavor approximation. In this connection Dr. Jacobs' references to suggested uses of synthetic flavors offers valuable guidance.

Besides the major vitamins now added to foods, the vitamin chapter mentions others that have little likelihood of being so employed. Some of the practical aspects of the incorporation of vitamins in foods are mentioned.

While the book is quite free of typographical errors, it is deserving of a more adequate index. A valuable addition would have been the names of suppliers of materials referred to by trade names.

Dr. Jacobs is to be commended for compiling such useful information from scattered sources, which he has amply cited, and from his own experience as Chief Chemist of the Bureau of Food and Drugs of the New York City Department of Health.

Other Publications

HANDBOOK OF CHEMISTRY by Norbert A. Lange. Price previously stated incorrectly. $7.00.

CATALOG OF AUXILIARY PUBLICATIONS IN MICROFILMS AND PHOTOPRINTS is a listing of documents deposited with the American Documentation Institute under its auxiliary publication program. The documents have been microfilmed or photoprinted, and the price of each is listed in this catalog. The catalog can be obtained without charge from the Institute, 1719 N. Street, N.W., Washington 6, D. C.

THE COOPERAGE HANDBOOK by Fred Putnam Hankerson will be of invaluable assistance to the manufacturer in the choice of satisfactory barrels for shipping his products. It includes information about the manufacture of barrels, their proper choice, their handling and storage and advise about lining. Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. Price $3.75.

BRITISH CHEMICALS AND THEIR MANUFACTURERS is the third revision of the official directory of the Association of British Chemical Manufacturers. It includes a classified list of British Chemicals and a list of Proprietary and Trade Names and Proprietary and Trade Marks, as well as a directory of the members of the Association. Copies will be sent to inquirers without charge. The Association of British Chemical Manufacturers, 166 Piccadilly, London, W. 1.

PULPWOOD STANDS, PROCUREMENT AND UTILIZATION, the fourth volume in the series of monographs of the Technical Association of the Pulp and Paper Industry. It covers the present status of the pulpwood forests, modern methods of pulpwood procurement and the full utilization of woods that are used by the pulp and paper industry. Non-members of the Association may purchase copies from the Association, 122 East 42nd St., New York 17, N. Y. for $5.00 per copy. ($6.00 in other countries).

Directory of Biological Laboratories, third edition, lists laboratories of the U.S. concerned with biological, bacteriological or biochemical investigations. This issue is completely revised. It contains 117 pages and the price is $3.00 a copy. Burns Compiling & Research Organization, 200 Railway Exchange Bldg., Chicago 4, Ill.

New Developments in Hardwood Pulp is a discussion of experimental work on the pulping of hardwoods and the new market this opens for low-grade wood. This is bulletin 14 of the Northeastern Wood Utilization Council, P. O. Box 1577, New Haven 6, Conn. $2.00.

Basic Criteria Used In Wage Negotiations prepared by Sumner H. Slichter is an analysis of the fundamental factors involved in the question of sound wage adjustment. Seven standards which are commonly considered in wage negotiations are listed and analysed. Chicago Association of Commerce and Industry, 1 North LaSalle St., Chicago 2, Ill. $.50.

Directory of Research and Development Facilities at Educational Institutions in New York State is an eighty page booklet which lists sources of technical assistance available to New York State manufacturers, and includes a panoramic chart. The booklet can be obtained without cost from the N. Y. State Dept. of Commerce, 112 State St., Albany 7, N. Y.

A. S. T. M. Specifications For Steel Piping Materials. This 307 page book contains 14 specifications covering various types of pipe. A. S. T. M. Headquarters, 1916 Race St., Philadelphia 3, Pa. Price, $3.00.

A. S. T. M. Standards on Petroleum Products and Lubricants details some 130 A. S. T. M. test methods, specifications and definitions of terms relating to petroleum and petroleum products. It is a new and enlarged edition of the Compilation of A. S. T. M. on P. P. & L. Three proposed tests (Sulfated Residue of Lubricating Oils, Test for Phosphorous in Organic Materials, and Test for Aromatic Hydrocarbons in Mixtures with Naphthenes and Paraffins by Silica Gel Adsorption), are published in draft form for constructive criticism. 615 pages. A. S. T. M. Headquarters, Philadelphia, Pa. Price $4.00.

A. S. T. M. Symposium on Oil Procurement Practices comprises papers presented at the A. S. T. M. Symposium 1946 annual meeting. A. S. T. M. Headquarters, Philadelphia 3, Pa. Price $1.00.

Glass Factory Year Book and Directory, contains complete data on all manufacturers of glass products in the United States and Canada. Glass products are classified and there are indexes of raw materials and equipment. American Glass Review, Century Bldg., Pittsburgh 22, Pa. Price $5.00.

The Utilization of Sugar Cane Bagasse for Paper, Board, Plastics, and Chemicals, edited by Clarence J. West, a bibliography of articles about the use of bagasse as a source of pulp, paper, and board. All important articles up to October 1945 are included, although the bibliography is not complete. Scientific Report No. 3. The Sugar Research Foundation, Inc., New York 5, N. Y. No charge.

Invertase by Carl Neuberg and Irene S. Roberts, a monograph which includes chapters on the nomenclature, sources, preparation, properties and applications on Invertase, as well as other information on this subject. Scientific Report No. 4, The Sugar Research Foundation, Inc., 52 Wall St., New York 5, N. Y. No charge.

A. S. T. M. Standards on Paper and Paper Products gives 57 tests for paper, such as tests for flammability, opacity, wet curl, tensile breaking strength, etc. A. S. T. M. Headquarters, 1916 Race St., Philadelphia 3, Pa. Price $2.00.

Sugar and Sugar By-Products in the Plastics Industry by Louis Long, Jr., a report of the various uses which may be made of sugar in the plastics industry. A list of references is included. This is Scientific Report No. 1 of the Sugar Research Foundation, Inc., and may be obtained from the foundation without charge.

Sugars and Sugar Derivatives in Pharmacy by Paul S. Pittenger, a booklet on the use of sugar as a pharmaceutical necessity in the production of modern scientific medicinal agents. Scientific Report No. 5, The Sugar Research Foundation, Inc., 52 Wall St., New York 5, N. Y. No charge.

German Cosmetic, Perfumery and Soap Formulae contains the original formulas for hundred of Germany's best face creams, perfumes, soaps, hair tonics, shampoos and other cosmetic products. Report PB-47526, Office of Technical Services, Department of Commerce, Washington 25, D. C. $3.00 for microfilm copies. Mimeographed copies, Hubart Publishing Co., Box 4127 Chevy Chase Branch, Washington 15, D. C., $5.00.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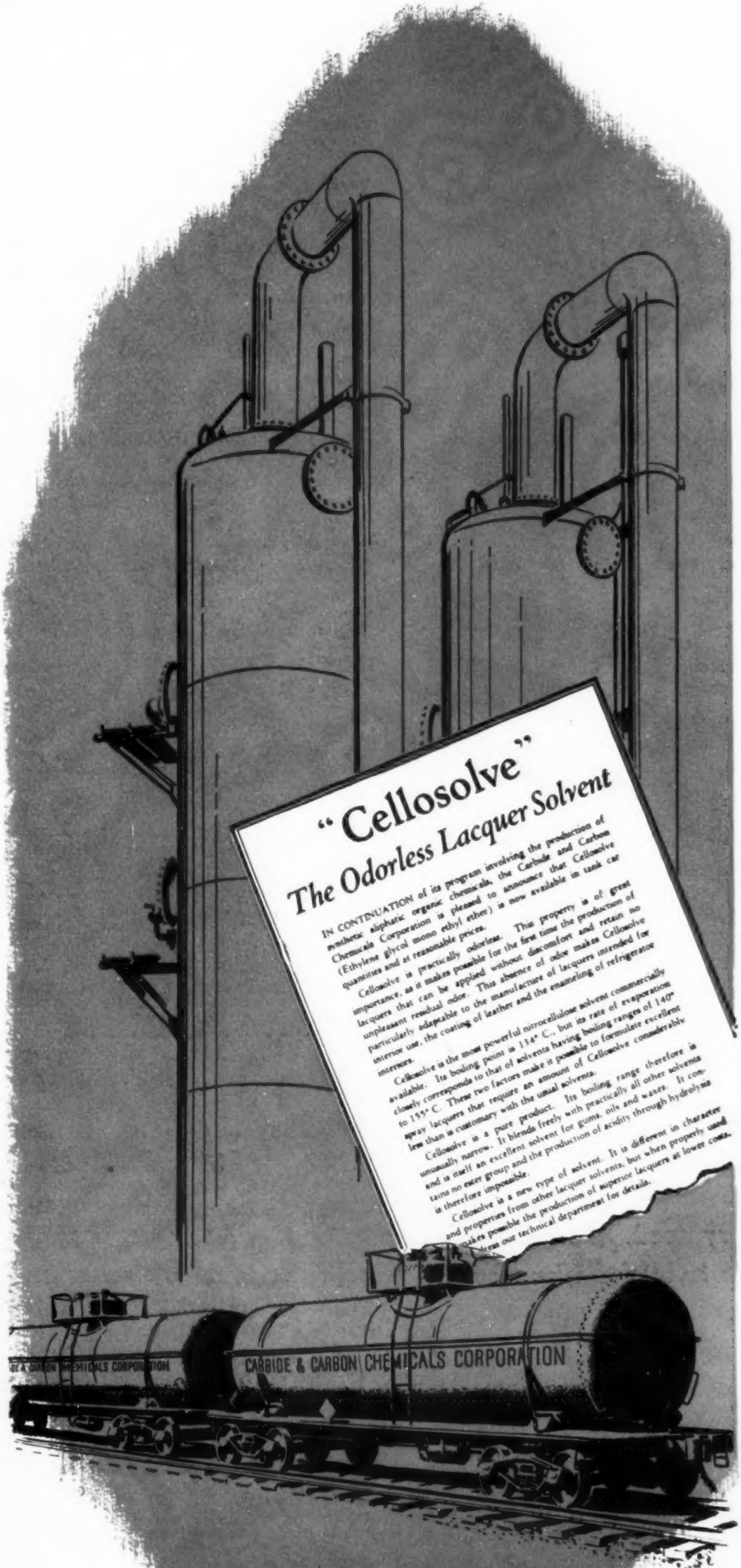

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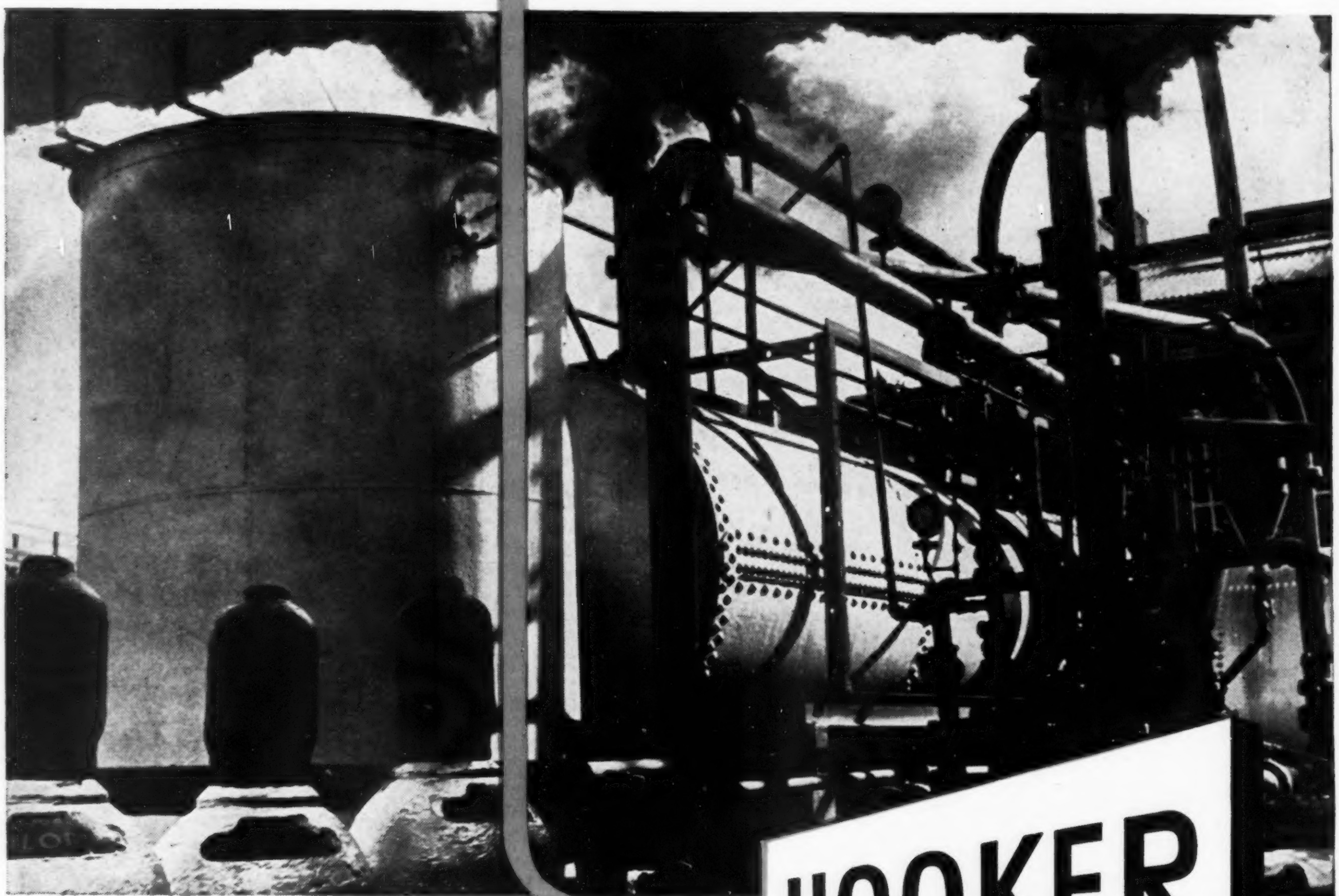

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NEWS OF THE MONTH

FTC Eyes Drum and Chemical Mergers

The Federal Trade Commission has reported to Congress on extensive mergers by which major steel interests now control 87 per cent of the steel drum fabricating capacity of the country, where prior to the war, only 10 per cent of this capacity was dominated by larger companies.

Seven of the large basic steel producers, says the Commission, now hold 87 per cent of the heavy steel drum and steel barrel capacity of the country, holding all capacity on the Pacific coast, and St. Louis areas, 86 per cent in the Chicago area; 95 per cent in New Orleans and Houston areas and on the Atlantic coast.

The Commission has also been studying chemical mergers, in which field, including drugs, the Commission says the largest number of acquisitions of smaller companies by larger organizations has occurred.

McDonald Appointed Varcum Vice-President

R. D. McDonald, formerly technical director, Varcum Chemical Corp., has been advanced to the post of vice-president in charge of research.

Government Controls to Ease

Remaining war-time controls were generally undergoing liquidation during April, with the prospect that by mid-Summer at latest, most, if not all, will have disappeared.

An outline of the situation as it will appear until that time shows allocation controls still in effect on certain drugs and commodities; control over distribution and use of natural rubber and synthetic rubbers, as well as establishment of specifications for products manufactured from these rubbers. Allocation continues on antimony, and restrictions remain on sale, distribution and use of tin cans and tin itself.

Specifically, there remain on the books, M-131, M-300 (cinchona, alkaloids, streptomycin); R-1 (rubber); M-63 (tin and fibers); M-84 (fibers); M-43 (tin and pig tin); M-81 (cans); M-112 (antimony (PR-16 (for appeals) and certain orders on steel exports.

Congress authorized continuance of the synthetic rubber program until permanent legislation is enacted, or until March 31, 1948, but ended Government purchases of natural rubber as of March 31, 1947.

As of April 1, R. F. C. ceased to be the sole importer of natural rubber, as the recent legislation now permits private imports. However, the low specifically continued controls over natural rubber consumption, specifications and inventories.

Natural Gas Control Debated

Federal Power Commission's control over natural gas is under legislative attack again. Companion bills in House and Senate, on which hearings are being conducted, would strictly define the Commission's authority.

Meanwhile, a steel pipe shortage (expected to continue through the rest of the year) is likely to seriously interfere with proposed extensions of pipelines pumping natural gas from Southwestern fields into the Eastern industrial areas.

Government agencies held a closed meeting recently to consider the fact that pipeline construction already approved would absorb more pipe than there is present capacity to make. Projected extensions into new industry consuming areas are far behind because of the vague prospect of getting pipe, even if the Commission approves the lines.

Nitrogen Exports Debated

The Department of Agriculture is preparing a report on nitrogen, in view of the continued pressure on supplies. Domestic fertilizer producers have suggested that if international export controls on fertilizers are removed similar termination of export controls on domestic exports should be ordered.

This country will export 67,000 tons of nitrogen this year and will import 200,000 tons. Industry representatives appear confident that next year there will be sufficient production to meet domestic needs.

However, it is possible that Congress will be urged to compel reduced exports of nitrogen next year on the ground that domestic requirements must be met. This will depend on whose figures prevail as to estimated need, those of the Department of Agriculture or those of industry.

According to consular sources at Berlin, it is planned to attempt to meet part of the German requirements in the American zone up to June, 1947, from recovered German ammunition. Some 45,000 tons of nitrogen fertilizer can be obtained by ordnance plants in the American zone, aided perhaps by surplus production in French and British zones.

Clark Named Carborundum President

H. K. Clark, elected president, The Carborundum Co. He succeeds Arthur Batts, now board chairman.

Industrial Conference For Pacific Coast

The Pacific Industrial Conferences have been scheduled to run concurrently with the Pacific Chemical Exposition to be held in San Francisco Civic Auditorium from Oct. 21-25.

The California Section of the American Chemical Society will be host to ten groups which have been organized to provide the bulk of the program material for the Industrial Conferences. Major emphasis will be on applications of recent scientific developments. The meetings will be open to all Exposition registrants.

Texas Organization Plans Chemurgy Promotion

Directors of the recently formed Texas Chemurgic Council have voted to set up the organization on a permanent basis, with Dallas headquarters and an opera-

ting budget of $50,000 for the first year. Plans call for a technical staff under a managing director who will work with regional chambers of commerce to encourage the development of chemurgic industries.

Among the projects under consideration are: adaptation of new crops; processing of vegetable wastes; and conversion of waste cotton burrs into wallboard. In particular, the value of ramie as a new fiber and protein crop is to be investigated, as well as production of papain from green papayas, and the worth of sesame as a vegetable crop.

CALENDAR *of* EVENTS

AMERICAN ASSOCIATION OF CEREAL CHEMISTS, 32nd annual convention, Hotel President, Kansas City, May 19-23.

AMERICAN COUNCIL OF COMMERCIAL LABORATORIES, Los Angeles, May 26-27.

AMERICAN DRUG MANUFACTURERS ASSOCIATION, annual convention, The Homestead, Hot Springs, Va., June 9-12.

AMERICAN GAS ASSOCIATION, Joint Production and Chemical Committee Conference, Hotel New Yorker, New York, June 2-4

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, summer meeting, Montreal, Quebec, Canada, June 9-13.

AMERICAN LEATHER CHEMISTS ASSOCIATION, annual meeting, Edgewater Beach Hotel, Chicago, June 18-21.

AMERICAN MANAGEMENT ASSOCIATION, general management conference, Hotel Pennsylvania, N. Y., June 11-12.

AMERICAN OIL CHEMISTS' SOCIETY, annual meeting, Hotel Roosevelt, New Orleans, May 20-23.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, semi-annual meeting, Stevens Hotel, Chicago, June 16-19.

AMERICAN SOCIETY FOR TESTING MATERIALS, 50th annual meeting, Atlantic City, June 16-20.

CHEMICAL INSTITUTE OF CANADA, annual conference, Banff, Alberta, Canada, June 8-11.

METAL POWDER ASSOCIATION, third annual Spring meeting, Waldorf-Astoria, May 27.

NATIONAL ASSOCIATION OF INSECTICIDE AND DISINFECTANT MANUFACTURERS, INC., mid-year meeting, Hotel Edgewater Beach, Chicago, June 9-11.

NATIONAL FERTILIvER ASSOCIATION, annual meeting, Essex and Sussex Hotel, Spring Lake, N. J., June 19-21.

NORTHEASTERN WOOD UTILIZATION COUNCIL, Hotel New Warden, Saratoga Springs, June, 13.

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION, Spring outing, Seaview Country Club, Absecon, N. J., May 26-28.

THE INSTRUMENT SOCIETY OF AMERICA, second national instrument conference Chicago, Sept. 8-12.

XIth INTERNATIONAL CONGRESS OF PURE AND APPLIED CHEMISTRY, London, July 17-24.

Shell Boosts British Chemical Output

Shell Petroleum Co., Ltd., has completed plans for a new petroleum-based chemical project to be built in Cheshire, England. All petroleum used as a raw material will be imported from sterling sources. The net result of expanded chemical output may pare Britain's imports of U. S. chemicals by some $4 million annually.

The company plans the doubling of synthetic detergent and wetting agent production—from its 24,000 ton per annum level—and also is scheduling an increase in output of insecticides and fungicides to about 30,000 tons annually.

Hopkins Joins American Maize

A. C. Hopkins Jr., named sales manager of American Maize Products Co.'s chemical division. Formerly with Commercial Solvents Corp., Mr. Hopkins has enjoyed 14 years experience in research, production, and sales.

German Chemical Exports

Under a tentative plan reported via American sources at Bremen, exports of the German chemical industry may reach a value of 47 million reichmarks this year.

Among the materials listed for export are: dyes, pigments, and various heavy chemicals. Actual completion of the plan will rely however on the availability of sufficient coal, gas, electric power, and raw materials.

COMPANIES

THE PARAMET CORP., manufacturer of synthetic resins, Long Island City, N. Y., will move its manufacturing operations to a new plant now being built in Toledo, Ohio. The new plant is expected to be in operation about July.

A unit for the production of methyl isobutyl ketone and methyl isobutyl carbinol is under construction at the Houston plant of SHELL CHEMICAL CORP. Production of the two solvents is scheduled to begin early this summer. Cost is estimated at $2.2 million, including general plant facilities.

The MICHIGAN CHEMICAL CORP., St. Louis, Mich., has established a subsidiary, Michemco Corp., to operate a unit at Pine Bluff, Ark. Chlorinated insecticidal chemicals will be manufactured. Operation is expected to get under way within the next few months.

AMERICAN POTASH & CHEMICAL CORP., New York, plans construction of a new soda ash and borax plant at Trona, Cal. The construction, together with expansion of power facilities, is expected to cost about $6 million.

SYNTHETIC RESINS, INC., a new corporation, is building a plant at Valdosta,

Fla. The plant will manufacture a line of rosin-based products. Charles C. Gillican is president of the new firm.

The A. E. Staley Manufacturing Co. plans to modernize and expand its corn refinery plant at Decatur, Ill. The major portion of the work will be the creation of additional processing facilities. Corn grind capacity of the plant will be increased from 50,000 bushels daily to 75,000 bushels.

Mottern Heads Up Heinz Research

H. H. Mottern, named research director, H. J. Heinz Co. He joined Heinz in 1945 after 15 years with the USDA.

The American Cyanamid Co. has made a credit agreement with the Guaranty Trust Co. providing new funds up to 25 million dollars to aid in its expansion program.

A $2 million construction program is now under way to build diversification into the Jayhawk Works of the Spencer Chemical Co. In addition to nitrogen products, dry ice and methyl alcohol will be added to the plant's products.

The Dicalite Co. has moved its Eastern Div. Sales Office from 120 Wall St. to 18 E. 48th St., New York.

The Texas Co. has established a fellowship at Northwestern U. for the study of the fundamentals of thiophene chemistry. Research will be in charge of R. K. Summerbell, chairman of the Department of Chemistry.

Construction of a new research center for Carbide and Carbon Chemicals Corp. at South Charleston, West Va. is now underway. The new laboratories will replace existing facilities, and will eventually house the fundamental research activities of Carbide and Carbon.

The American Cyanamid Co. has leased for a long term a floor in the building at 48 W. 38th St., New York, for laboratory, executive and sales offices.

Carbide and Carbon Chemicals Corp. is planning to double its wartime production of polyethylene resins at the South Charleston, West Va. plant. Present production is already more than six times the original rated capacity, but not sufficient to meet demand.

Ott Promoted by Pennsalt

Edwin M. Ott, appointed assistant manager of market research, Pennsylvania Salt Manufacturing Co. Formerly with Gulf Research and Development Co. he joined Pennsalt in 1940.

The Technical Supply Co., 517 Northwestern Bank Bldg., Minneapolis, has been organized by George W. Porter. Among other principals he represents The American Resinous Chemicals Corp., Schaar and Co., the Wiley Alloy Tube Co., and the Walter Kidde Co. Mr. Porter was formerly with the Minnesota and Ontario Paper Co.

The Leslie Salt Co., Alameda County, Col., plans a two-story addition to its present refinery for screening and processing of crude salt.

Charles M. Rice, recently of Falk & Co., Pittsburgh, has opened an office and laboratory for the distribution of resins, pigments and driers. The location of the Rice & Co. office is 319 Citizens Bldg., Cleveland, Ohio.

Burroughs-Wellcome & Co., Inc., pharmaceutical manufacturer, is locating its west coast headquarters at San Francisco. It is leasing a warehouse on Folsom St. which will provide approximately 12,000 square feet of space.

American Lumber and Treating Co. has opened a plant designed to alloy wood with creosote in Baltimore's Fairfield industrial district. This is one of ten operated throughout the country. The unit covers about five acres and is adjacent to the Weyhaeuser Sales Co. Chemical processing facilities will be operated for Weyhaeuser and other members of the lumber industry. Lewis H. Harper has been named plant superintendent.

At their recent annual meeting, stockholders of National Oil Products Co. voted to change the company's name to Nopco Chemical Co.

Construction involving $50 million for facilities for the production of new postwar products is in the engineering and planning stages at Monsanto Chemical Co. More than $22 million in construction is already under way.

A Baltimore, Md., chemical plant constructed by the War Production Board for experimental production of glycerin from molasses distillery residue has been

sold for $90,000 cash to the U. S. INDUSTRIAL CHEMICALS, INC., the plant's wartime operator. The sale includes two buildings, plus items of production equipment which cost the government about $263,435. No land was involved.

The Cellulose Products Dept. of HERCULES POWDER Co. has opened an office at Cincinnati, Ohio. Henry Grace, formerly in charge of the department's Washington, D. C., office, has been appointed manager.

ALLIED CHEMICAL & DYE CORP. is offering 27 graduate Fellowships, mainly in chemistry and chemical engineering, in 22 universities and institutes of technology for the school year 1947-48. The recipients of the Fellowships are selected by the schools. Each Fellowship provides a stipend of $1,200 and tuition.

CANADA

Shawinigan Extends Acetaldehyde Facilities

Shawinigan Chemicals Ltd. invested $583,000 in new facilities during 1946, according to the company's annual report, and is at present constructing an additional unit for the manufacture of acetaldehyde.

With sales dipping slightly from the 1945 level, due to the cessation of war contracts and the limited availability of containers, earnings for the year amounted to $2,019,349, compared with $2,513,124 in the preceding year. After providing for income and excess profits taxes earned surplus was $1,038,349 — almost double 1945's $529,124.

Chemical Men Eye Labor Outlook

During the war the Canadian chemical industry was notably free from labor troubles, and actually won the Minister of Labor's commendation for its unique record in the nation's industries. Its workers have always been among the highest paid and have not, in the main, been unionized. But recently, as labor collectively flexed its war-born muscles, chemical producers too encountered labor strife. There were two major strikes last fall, but what is more significant is the fact that two U. S.-controlled unions are now actively campaigning to enroll chemical workers.

There are two main contenders in the field, the United Mine Workers of America (CIO) which claims to have enrolled 4,500 workers in 22 locals, and the International Chemical Workers (AFL) with 35 locals and a claimed membership of 7,000. Both are campaigning for more representation among the Dominion's chemical workers with immediate objectives of 6000 and 10,000 members, respectively. A jurisdictional battle may be in the offing between the rival unions.

Bowles Heads Product Development

John A. C. Bowles, named director of the newly-created product development laboratory of Sharp & Dohme Inc. He was previously with Rexall.

Improved Patent Facilities Planned

The number of patent applications filed with the Canadian Patent Office—of which the majority originate with U. S. inventors—has been increasing steadily during the past decade. And of the total number of applications filed those dealing

with chemicals and chemical processes form the largest category.

But the Canadian Patent Office has long been criticized for the delays attendant upon the issuance of patents, and for its inadequate searching facilities. Recently, however, the Secretary of State has indicated that the government has become more conscious of the deficiencies of the patent bureau, and plans to hire additional examiners, extend office space, and is considering a system for printing patents for public distribution.

Although these plans have not been implemented as yet it is anticipated that definite action will be taken in the near future.

PERSONNEL

Company Officers

A. H. CLARKE has been elected vice-president in charge of the general production department of the Bemis Bag Co. Mr. Clarke is a graduate of Amherst and M. I. T.

A. N. BOWERS has been appointed manager, Process Industries Div. and J. ALBERT POST, JR. has been appointed manager, Petroleum Process Division of the Cornell Machine Co., New York City.

The following new members have been elected to the Fritzche Bros., Inc. board of directors: ERNEST GUENTHER, chief chemist; B. F. ZIMMER, JR. and FRED H. LEONHARDT.

FREDERICK M. EATON, partner in the New York law firm of Sherman & Sterling & Wright, and former general counsel of the WPB has been elected to the board of directors of Monsanto Chemical Co.

DAVID SCHEIFELE has joined the staff of the Allied Carbon & Chemicals Co., Los Angeles. Mr. Scheiffele was formerly director of operations of the Heavy Chemicals Purchasing Dept. of McKesson & Robbins, Inc.

MARK M. BIDDISON, formerly general manager of General Chemical Co., has been named vice-president of the organization. Mr. Biddison joined General in 1918 as a salesman.

Production

JOHN H. LONBOTTOM has joined Sharp and Dohme, Inc. as packaging and research specialist. He will make his headquarters in the Glenolden Research Laboratories. Dr. Longbottom was formerly with A. H. Wirz, Inc.

DARRELL ALTHAUSEN has succeeded A. NICOLAUS as manager of Fritzsche Brothers, Inc., Clifton, N. J. factory. Dr. Nicolaus has retired after more than twenty-five years with Fritzche Brothers.

JAMES ELLIS WILDRICK and RANDOLPH F. HARRIS have joined the staff of the Exton Chemical Div. of Foote Mineral Co. Mr. Wildrick is a mechanical engineer and Mr. Harris a chemical engineer.

Research

FREDERICK L. MATTHEWS has been appointed associate director of research of Monsanto Chemical Co.'s Merrimac Div. Dr. Matthew's former post of coordinator of petroleum additives will be filled by HARRY W. FAUST.

Commercial Solvents Corp. has added GEORGE H. CRAIG and ELI ZINN to its research and development dept.

J. EVERETT BUSSART has joined the Velsicol Corp., Chicago, as entomologist. He was graduated from the University of Illinois with B. S. and M. S. degrees in entomology.

DOMINICK F. RAZZANO has been advanced to the post of chief chemist of the Hilo Varnish Corp. research and development laboratories.
He has been with Hilo since 1934.

Sales

FRED E. TROPP has been appointed manager of technical sales for Falk & Co. His assistant will be PETER J. BURKHART.

The Davison Chemical Corp. has appointed WILLIAM CASPARI as general sales manager of the Phosphate Rock Div., Bartow, Fla. He has been with Davison thirty-one years.

FRANK G. KEENEN has been named assistant sales manager, nitrogen products section sales div., Du Pont Co.'s Ammonia Dept.

M. G. FOLSOM, G. W. HULDRUM, JR., and G. E. GARLAND have been appointed managers of new sales districts of the Shell Chemical Corp.

CHEMICAL SPECIALTIES

A department devoted to news of the chemical specialties field. Descriptions of new specialty products will be found in the New Products & Processes department.

Soil-Off Heads for National Distribution

Starting with an original capital of $15 back in 1934 the Soil-Off Manufacturing Co., founded in California, has now reached a stature of $2.5 million per annum in sales volume. And this year the company is planning national distribution—backing its campaign with a $300,000 advertising appropriation. If market conditions warrant this budget may be upped to support the marketing of the liquid wall cleaner.

In preparation for nationwide distribution Soil-Off opened a second factory last year at Decatur, Ill., to serve the Middle West and East. No further expansion of facilities is scheduled for the nonce, although plans are being laid for the addition of other products to the line.

Apart from the merit of the product itself, attractive packaging has done much to promote sales. The glass bottle with ceramic fused-in label has facilitated consumer identification, in a field where many competitive products retail for half Soil-Off's 60 cents per quart price. And not to be overlooked is the wider margin of profit that distributors and retailers get for selling the higher-priced cleaner.

Pittsburgh Paint Doubles Houston Unit

Pittsburgh Plate Glass Co. has begun initial work on a $500,000 expansion of its Houston, Texas, paint and varnish plant. Total floor space of the present unit will be doubled to 120,000 square feet.

Production capacity of the plant will be correspondingly doubled. In addition a new control and development laboratory will be built as an adjunct to the new project.

New Chemical Coating For Blueprints

An improved chemical coating which deepens the blue of a blueprint and increases legibility of the paper is being introduced by Monsanto Chemical Co.

The product is a silica aquasol known as Mertone WB-2, and is used as a precoat on a paper which is subsequently coated with light-sensitive blueprint solutions.

The precoat makes possible a more uniform coverage by the blueprint solutions, provides greater brilliance and color depth and increased legibility to the paper. It also minimizes the greying effect caused by over-exposure. Applicable to all types of blueprint formulae, Mertone can be applied in paper mills and coating plants on the same machine used to apply the sensitizing solution.

The use of the silica aquasol was developed by the H. P. Andrews Paper Co. as an exclusive license.

The right to sublicense has been granted to Monsanto.

Schering Advances McDonnell

John N. McDonnell, named to the position of vice-president, Schering Corp. He will be headquartered at Bloomfield, N. J.

Introduce Capsulated Germicide Powder

A capsulated germicide, packaged under the brandname of Steryl, is now being sold by Service Industries, Philadelphia.

The directions call for dissolving the contents of one capsule in five gallons of ordinary water for "on the spot" preparation of a germicidal, or sanitizing, solution.

It is claimed to be non-poisonous, harmless to the skin, mildly akaline, and stable over a wide temperature range.

Goodyear Introduces Novel Printing Ink

A novel fast-drying printing ink, in which a resin of the Pliolite type is used, has been introduced recently by the Goodyear Tire and Rubber Co. Inc. Present marketing plans call for sale of the resin to ink-makers, who will in turn formulate and sell their own brands of fast-drying inks.

According to L. B. Sebrell, director of the Goodyear laboratory, the ink has been used successfully in letter press printing, and lately its quick-drying characteristics have been developed. The new product works by absorption of a high-boiling petroleum solvent into paper, and since the resin oxidizes rather slowly, there is no drying out on the press.

F. G. Okie Inc., Philadelphia, pioneered the development. Other concerns reported to be working with the resin-based product include: Sun Chemical Corp.; International Printing Ink Co.; Frederick H. Levey; Pope and Gray, and Sinclair and Valentine.

New Product Marketings

With some easing in the container situation, and the prospect of more competitive days in the offing, many specialty manufacturers are investigating the possibility of adding new items to their lines. Too, there are some new entrants in the field, as well as companies which have confined distribution to a comparatively small area but are now launching plans for national distribution.

Among the highlights:

The Tobacco By-Products & Chemical Co., Louisville, plans to conduct a state-by-state campaign for a new mosquito control item.

The Miler Corp., Chicago, is introducing a brushless paint (applied by means of a cloth). Tradename: Sleek.

Ridgefield Chemical Products Co. is scheduling national distribution of Dry Wash Hand Cleaner. Designed to remove oil, grease, paint, etc., it is claimed to contain lanolin to prevent skin-roughening.

Armour & Co., Chicago, is promoting a new detergent, tradenamed Trill, in the Chicago area. National distribution is anticipated.

Whitehall Pharmacal Co. is test-marketing an athlete's foot remedy in southern markets. Tradename: Sprint.

Sicca Soya Paint Co., Peoria, is extending advertising of Sta-Par Paint and Plastic Plaster.

El Camino Petroleum Co., Los Angeles, is pushing Parfum, a perfumed naphtha-type household dry cleaner on the Pacific Coast. Reports indicate that national distribution will be the next step.

Procter & Gamble, Cincinnati, is marketing Tide, a new detergent, in several localities. It is also promoting Spic and Span, its glue-containing alkali cleaner, by means of heavy spot radio announcements, and a substantial prize contest schedule.

New Glass Cleaner And Anti-Fogging Agent

The development of a glass cleaning anti-fogging agent for use on eye glasses, automobile windshields, windows and any other glass surfaces subject to fog formation has been completed by Engineering Associates, Inc., St. Charles, Illinois.

This new product, which has been given

the name "C-All," is a water white liquid that is applied to the glass and then wiped clean.

It is claimed that it cleans the glass surface and deposits an invisible film on the surface that acts to prevent fog formation. This film is said to be relatively long-lasting.

A few of the suggested uses are eye glasses, auto windshields, windows, mirrors and for cleaning lenses on cameras and scientific instruments.

Rotenone Favored for Agricultural Dusts

Experiments conducted by the New York State Experiment Station indicate that cucumber beetles can best be controlled by means of a dust containing one per cent rotenone, and five to seven per cent copper. A compound of ten per cent calcium arsenate plus seven per cent copper also acts as a good control agent.

Although DDT dusts also have merit in combating the beetle, Station entomologists warn against its indiscriminate use on cucumbers because it has seriously stunted some varieties.

Both DDT and rotenone have been tested on squash borers. They have proved to be quite effective, but the rotenone product appears to be the safer to use.

Winthrop Promotes Salt Substitute

A new pharmaceutical product, designed to serve as a dietary substitute for common salt, has recently been placed on the market by Winthrop Chemical Co., Rensselaer, N. Y. It will be sold through retail drug stores as a specialty item for those people who must abstain from the use of ordinary salt.

Packaged in 2-ounce shakers and 8-ounce bottles under the tradename of Neocurtasal its essential ingredients are: potassium chloride, ammonium chloride, potassium formate, calcium formate, magnesium citrate, and starch.

Bickerton Joins Walker Fertilizer

J. M. Bickerton has joined the Walker Fertilizer Co., Orlando, Fla. He will be concerned with technical sales problems, particularly in connection with insecticides, fungicides and herbicides.

Pennsalt Adds to Cleaner Line

A new general purpose inorganic cleaner, designed for maintenance work but suitable for other uses, is being introduced by the Pennsylvania Salt Manufacturing Co.

The cleaner, designed Pennsalt MC-1, is a dry, granular water-soluble compound. It is not a soap nor is soap necessary with its use.

Pennsalt MC-1 is designed for general purpose janitor cleaning, and for industrial use. It may be used in steam gun cleaning of painted or unpainted surfaces. Two to four pounds the salt is adequate for 50 or 55 gallons of solution.

Packed in 125 or 250 pound plywood drums, it is being sold by the Special Chemicals Sales Division.

Renuzit Broadens Advertising Schedules

Renuzit Home Products Co., Philadelphia, is planning to launch a new test advertising campaign for its solvent dry cleaner.

According to recent reports the company will direct its advertising at a mixed audience, emphasizing use of the product for cleaning men's ties. Another feature: double-your-money-back guarantee.

CHEMICAL MARKETS

Record Barite Production

Barite production in 1946 set a new record of 723,919 short tons, 5 per cent greater than output in the previous record year, 1945. Fourth quarter output was 188,564 tons in 1946, compared with 170,345 tons for the comparable 1945 quarter.

A slight decline was registered from third quarter production, owing to cold weather, which always curtails operations at barite washers and flotation mills.

As in each year since and including 1944, Arkansas again led production in 1946 with 288,286 short tons, followed closely by Missouri with 273,618 tons. Georgia, Tennessee, California, Nevada, and Arizona followed in that order.

The major use of barite in 1946 was in weighting rotary drilling muds in high-pressure oil and gas areas. The expectation earlier in the year that 1946 would set another record for shipments to well drillers was not realized, and 1945 remains the historical high with 413,620 tons declining to 374,799 in 1946. This decrease of 39,000 tons in the drilling market apparently had little effect on producers' schedules, for an increase of 36,000 tons was noted in shipments to lithopone and chemical manufacturers over 1945 receipts, and also glass and filler shipments were up 15,000 tons. Exports to South American oil fields were sizable in 1946, but data cannot be published. Summing up, shipments to all consumers was 2 per cent greater in 1946 than in 1945.

Streptomycin Output

The monthly production rate of streptomycin during 1946 increased from 26,332 grams in March, the month the drug was first allocated, to 200,040 grams in December, according to CPA.

Total production for the ten months in 1946 during which distribution was controlled by schedule 19 to general conservation order M-300 was 1,132,132 grams. Final allocations totaled 1,422,008 grams. Throughout the year allocation was made against accumulated supplies.

The total amount allocated for a month frequently was not delivered, CPA said, and it was thus possible to make allocations which on paper, actually exceeded production.

New High for Natural Gas

Marketed production of natural gas reached a new high of 3,918,686 million cubic feet in 1945, 6 per cent above the 1944 record. The principal gains in output were reported in Texas (186 billion cubic feet), Oklahoma (47 billion), New Mexico (17 billion), and Louisiana (8 billion). Production declined materially in Kansas and in the Appalachian region.

Each of the three major classes of consumers contributed to the 6 per cent gain in total consumption to 3,900,479 million cubic feet. Domestic consumers increased their use of natural gas 8 per cent over 1944, commercial consumers 4 per cent, and all industrials 5 per cent. Miscellaneous industrial use declined 14 billion cubic feet owing to a drop of about 34 billion cubic feet in consumption at electric public-utility power plants. Gains were reported by all other classes of industrial consumers, led by carbon-black manufacturers and oil and gas-field operators.

The several classes of consumers used the following quantities of natural gas in 1945 in millions of cubic feet: domestic 607,400, commercial 230,099, oil and gas field 916,952, carbon black 431,830, petroleum refineries 338,458, portland-cement plants 38,349, and miscellaneous industrial, including electric public-utility power plants, 1,337,391.

Casein Production and Stocks Increase

Dry casein production during February showed a 489 per cent increase over 1946 but the gain was not as large as in January, the Bureau of Agricultural Economics reports.

February production was estimated at 3,035,000 pounds, compared to 385,000 pounds a year earlier. Output was 61 per cent above the 1941-46 average for the month, but 195,000 pounds below the January figure.

Total stocks of dry casein held by domestic driers on February 28 totaled 2,940,000 pounds, a gain of 13 per cent from a year earlier.

Aluminum Stages Surprise Comeback

Aluminum producers although earlier presumed to face a serious light-metal surplus, found a demand in 1946 that could not be met even by the output level of 600,000 short tons annually reached by the year end, according to the Bureau of Mines. The revival in production rate was confined to the latter part of the year; total production of primary aluminum in the United States in 1946 was 409,630 tons, a quantity which nonetheless was 2½ times greater than that turned out in any year prior to 1940.

During 1946 aluminum production increased from 46 to 92 percent of privately-operated capacity, or from 34 to 68 percent of total (including inoperative Government) capacity. Delay in resum-

ing production on a scale commensurate with demand stemmed from problems in disposal of Government plants, shortages of electric power and soda ash, and some lack of those fabricating facilities required particularly for peace-time products. The allotment of soda ash to the aluminum industry was raised in October 1946, by an order of the Civilian Production Administration, from the former level of 60 percent to 85 percent of requirements.

Production of primary aluminum in the United States in 1946 was 409,630 short tons valued at $115,811,600—a decline of 17 percent in quantity compared with the ouptut of 495,060 tons valued at $140,864,000 in the final war year 1945. The annual rate of production increased from 300,000 tons early in 1946 to 600,000 tons by the end of the year. The recovery of secondary aluminum in 1946 is estimated at 270,000 short tons, 10 percent less than the output of 298,387 tons in 1945.

Lead Output Up

The average daily rate of lead production from domestic mines in February reached the highest level since November 1945, according to the Bureau of Mines, United States Department of the Interior. Although the total net production dropped 6 percent owing to the shorter month, the average daily output increased from 1,015 tons in January to 1,055 tons in February.

Advancing prices and a continued heavy demand for lead were largely responsible for the expanded rate of output in February. The month opened with lead at an all-time high of 13.00 cents per pound, New York, from which level it advanced to 14.00 cents on February 25 in order to meet increased quotations in the foreign markets.

Fertilizer Exports Soar; Imports Dip

Exports of fertilizers and fertilizer materials from the United States in 1946 amounted to 1,264,000 short tons, valued at $22,379,000, according to a summary prepared by The National Fertilizer Association. The increase over 1945 was 23 per cent in both tonnage and value.

Exports of nitrogenous materials, Florida phosphate rock, normal superphosphate and concentrated superphosphate were all greater than in 1945. Exports of potash materials, on the other hand, were lower than in the previous year. Total export tonnage in 1946 was the largest for any year since 1941, and the aggregate value of 1946 exports was the largest for any year in the 25 year period for which comparable figures are available.

Imports of fertilizers and fertilizer materials during 1946 were lower than in 1945. The total of 1,272,000 short tons for 1946 was 24 per cent lower than in the previous year, while the value of $37,684,000 was 13 per cent below 1945.

Sodium nitrate imports were 320,000 tons less than in 1945, a decrease of 38 per cent, and lower than imports in any of the war years. Imports of ammonium sulphate, as well as the group "all other phosphates," were considerably lower than in 1945 and many of the other items, which are not imported in large quantities, showed declines. Calcium cyanamide, however, was imported in substantially greater quantity than in 1945, reaching a new high point.

Record Potash Output

Five leading American potash producers made a new high record when they delivered 923,127 tons during 1946, the American Potash Institute reports.

The figure was 54,941 tons or 6.3 per cent greater than 1945 and continued for the twelfth year the unbroken record of increased deliveries. The total was in the form of 1,657,603 tons of potash salts.

Deliveries of agricultural purposes in the continental United States were 763,590 tons, an increase of 68,514 tons over 1945. Canada received 42,772 tons, Cuba 2,327 tons, Puerto Rica 18,958 tons and Hawaii 8,380 tons. Exports to other countries amounted to 10,963 tons.

Chemicals Wartime End-Use Distribution

CHLORINE

January 1, 1944—June 30, 1945
(*Short tons, pure basis*)

Uses	*Total Amount*	*Percent*
Total Allocations	2,092,248	100.0
Export	15,480	0.7
Direct military[1]	57,238	2.7
Other uses	2,019,530	96.6
Chemical manufacture	1,544,787	73.8
Paper processing	254,653	12.2
Metallurgical uses	100,179	4.8
Water treatment	62,730	3.0
Synthetic rubber	14,775	0.7
Food treatment	1,365	0.1
Petroleum refining	1,296	0.1
Miscellaneous uses and small orders	39,745	1.9

[1] End use data not available.

AQUA AMMONIA

January 1—June 30, 1943
(*Short tons, 100% basis*)

Uses	*Total Amount*	*Percent*
Total Allocations	30,927	100.0
Direct military[1]	33	0.1
Other uses	30,894	99.9
Chemical manufacture	11,363	36.7
Soda ash	3,457	11.2
Sulfuric acid	2,720	8.8
Ammonium chloride	2,474	8.0
Copper sulfate	730	2.3
Other chemicals	1,982	6.4
Metal refining	4,153	13.4
Dye intermediates	2,078	6.7
Explosives	1,664	5.4
Yeast manufacturing	1,417	4.6
Textile finishing and rayon manufacturing	828	2.7
Corrosion control	806	2.6
Pharmaceuticals	678	2.2
Fertilizer	623	2.0
Silica gel	615	2.0
Mildew proofing	306	1.0
Small orders	3,216	10.4
Miscellaneous uses	3,147	10.2

[1] End-use data not available.

DIPENTENE

July 1, 1944—December 31, 1944
(*Thousands of gallons*)

Use	*Total Amount*	*Percent*
Total Allocations	1,510	100.0
Export	5	0.3
Other uses	1,505	99.7
Rubber processing	1,074	71.1
Lubricants, cleaners, and carbonizing	154	10.2
Protective coating solvents	149	9.9
Disinfectants, insecticides, and soaps	56	3.7
Textiles	28	1.9
Synthetic resins	25	1.7
Miscellaneous uses and small orders	19	1.2

PENTAERYTHRITOL

January 1, 1944—June 30, 1945
(*Thousands of pounds, all grades*)

Uses	*Total Amount*	*Percent*
Total Allocations	21,602	100.0
Export	221	1.0
Resins and plastics	10,717	49.6
Explosives	9,275	42.9
Drying oils	1,072	5.0
Miscellaneous uses	317	1.5

CHEMICAL COTTON PULP

January 1, 1944—June 30, 1945
(*Short tons*)

Uses	*Total Amount*	*Percent*
Total Allocations	423,602	100.0
Export	3,160	0.8
Direct military[1]	196,240	46.3
Other uses	224,202	52.9
High tenacity yarn	110,168	26.0
Plastics, film, and lacquer	59,536	14.1
Rayon	35,598	8.4
Meat casings	5,250	1.2
Miscellaneous uses and small orders[2]	13,650	3.2

[1] End-use data not available.
[2] Includes cotton pulp for explosives produced in private plants.

PINE OIL

April 1—December 31, 1944
(*Thousands of gallons*)

Uses	*Total Amount*	*Percent*
Total Allocations	2,785	100.0
Export	340	12.2
Other uses	2,445	87.8
Disinfecting and cleaning	963	34.6
Disinfectants	581	20.9
Industrial cleaning	301	10.8
Laundries	51	1.8
Soaps and cleaning compounds	30	1.1
Textiles	512	18.4
Ore flotation	469	16.8
Paints, varnish, and enamels	128	4.6
Plywood	68	2.4
Paper products	30	1.1
Wood preservatives	26	0.9
Medicinal and pharmaceutical	19	0.7
Rubber	11	0.4
Inks	2	0.1
Miscellaneous uses and small orders	217	7.8

PINE TAR AND PINE TAR OIL

July 1, 1944—June 30, 1945
(*Thousands of gallons*)

Uses	*Total Amount*	*Percent*
Total Allocations	4,825	100.0
Export	328	6.8
Other uses	4,497	93.2
Rubber compounding	2,270	47.0
Rubber reclaiming	933	19.3
Cordage	657	13.6
Ship construction and maintenance	285	5.9
Medicinals and pharmaceuticals	86	1.8
Lubricants	62	1.3
Adhesives	48	1.0
Preservatives	35	0.7
Coating	27	0.5
Cutting oils	7	0.2
Belt dressing	5	0.1
Waterproofing compound	4	0.1
Flotation	3	0.1
Insecticides	3	0.1
Miscellaneous uses and small orders	72	1.5

CURRENT PRICES

Chemical prices quoted are of American manufacturers for spot New York, immediate shipment, unless otherwise specified. Products sold f.o.b. works are specified as such. Import chemicals are so designated.

Oils are quoted spot New York, ex-dock. Quotations f.o.b. mills, or for spot goods at the Pacific Coast are so designated.

Raw materials are quoted New York, f.o.b., or ex-dock. Materials sold f.o.b. works or delivered are so designated.

The current range is not "bid and asked," but are prices from different sellers, based on varying grades or quantities or both.

Purchasing Power of the Dollar: 1926 Average—$1.00
April, 1945, $0.871 *April, 1946, $0.842*
April, 1947, $0.624

	Current		1947		1946	
	Low	High	Low	High	Low	High
Acetaldehyde, 99%, drs.wks..lb.	.11	.15	.11	.15	.11	.14
Acetic Anhydride, drs.......lb.	.11½	.13	.11½	.13	.11½	.13
Acetone, tks, delv..........lb.	.07	.09	.07	.10	.06	.07
ACIDS						
Acetic, 28% bbls.......100 lbs.	3.78	4.08	3.38	4.08	3.38	3.63
Glacial, bbls.........100 lbs.	10.65	10.90	9.15	10.90	9.15	9.40
drs, wks..........100 lbs.	13.20	13.75	6.93	13.75	6.93	7.25
Acetylsalicylic, Standard USP....................lb.	.45	.59	.45	.59	.40	.59
Benzoic, tech, bbls..........lb.	.43	.47	.43	.47	.43	.47
USP, bbls., 4,000 lbs. up..lb.	....	.54	....	.54	....	.54
Boric tech, bbls, c-l......tons *a*	....	137.50	....	137.50	....	109.00
Chlorosulfonic, drs, wks.....lb.	.03	.04½	.03	.04½	.03	.04½
Citric, USP, crys, gran, bbls....................lb. *b*	.22	.23	.20	.23	.20	.21
Cresylic 50%, 210-215° HB, drs, wks, frt, equal......gal.	1.01	1.04	1.01	1.04	.81	1.04
Formic, 85%-90% cbys.....lb.	.12	.14½	.10	.14½	.10	.13
Hydrofluoric, 30% rubber, drs. ....lbs.	.08	.09	.08	.09	.08	.09
Lactic, 22%, lgt, bbls, wks..lb.	.039	.0415	.039	.0415	.039	.0415
44%, light, bbls, wks.....lb.	.073	.075	.073	.0755	.073	.0755
Maleic, Anhydride, drs......lb.	.25	.26	.25	.26	.25	.26
Muriatic 18° cbys......100 lbs.	1.50	2.90	1.50	2.90	1.50	2.45
20° cbys, c-l, wks....100 lbs.	....	2.00	....	2.00	....	1.75
22° cbys, c-l, wks....100 lbs.	....	2.50	....	2.50	....	6.00
Nitric, 36°, cbys, wks..100 lbs. *c*	5.00	6.30	5.00	6.30	5.00	5.25
38°, c-l, cbys, wks...100 lbs. *c*	....	5.50	....	5.50	....	5.50
40°, c-l, cbys, wks...100 lbs. *c*	....	6.50	....	6.50	....	6.00
42°, c-l, cbys, wks...100 lbs. *c*	....	7.00	....	7.00	....	6.50
Oxalic, bbls, wks............lb.	.13	.14	.11¾	.14	.11¼	.14½
Phosphoric, 100 lb. cbys, USP....................lb.	.10½	.13	.10½	.13	.10½	.13
Salicylic tech, bbls..........lb.	.31	.38	.26	.42	.26	.42
Sulfuric, 60°, tks, wks......ton	....	13.50	....	13.50	....	13.00
66°, tks, wks............ton	....	17.50	....	17.50	....	16.50
Fuming 20% tks, wks....ton	....	20.50	....	20.50	....	19.50
Tartaric, USP, bbls.........lb.	.49½	.50	.49½	.55	.54½	.71
Alcohol, Amyl (from Pentane) tks, delv................lb.	....	.151	....	.151	....	.131
Butyl, normal, syn, tks...lb.	....	.14½	....	.14½	....	.14½
Denatured, CD 14, c-l drs.................gal. *d*	....	1.06	....	1.06	....	.90
Denatured, SD, No. 1, tks. *d*	....	.98½	....	.98½	....	.82½
Ethyl, 190 proof tks.....gal.	....	18.08	....	18.08	....	17.94
Isobutyl, ref'd, drs.......lb.	....	.13	....	.13	....	.0860
Isopropyl ref'd, 91%, dms.................gal.	.47½	.50½	.41	.50½	.38	.47
Alum, ammonia, lump, bbls, wks.................100 lbs.	....	4.25	....	4.25	....	4.25
Aluminum, 98.99%....100 lbs.	15.00	16.00	15.00	16.00	15.00	16.00
Chloride anhyd, l.c.l. wks..lb.	....	.10¼	....	.10¼	.09	.12
Hydrate, light, bgs........lb.	....	.14½	....	.14½	....	.14½
Sulfate, com'l. bgs, wks, c-l................100 lbs.	1.15	1.30	1.15	1.30	1.15	1.25
Sulfate, iron-free, bgs, wks ....100 lbs.	1.95	2.50	1.75	2.50	1.75	2.00
Ammonia anyhd, cyl........lb.	.16	.20	.14½	.20	....	.14½
Ammonia, anhyd, fert, tank cars, wks, frt. equalized...ton	...	59.00	....	59.00	....	59.00
Ammonium Carbonate, USP, lumps, drs..............lb.	.08¼	.09½	.08¼	.09½	.08¼	.09½
Chloride,whi,bbls,wks,100lbs.	4.75	5.00	4.45	5.15	4.45	5.15
Nitrate, tech, bgs, wks....lb.	.0435	.0450	.0435	.0450	.0435	.0850
Oxalate pure, grn, bbls....lb.	...	.23	....	.23	....	.23
Perchlorate, kgs.........lb.	no stocks		no stocks		no stocks	
Phosphate, dibasic tech, bgs.......................lb.	.07	.07¾	.07	.07¾	.07	.07¾
Stearate, anhyd, drs.......lb.	....	.34	...	.34	....	.34
Sulfate, drs, bulk.........ton	30.00	32.00	30.00	32.00	28.20	30.00
Amyl Acetate (from pentane) tks, delv.............lb.	....	.21	...	.21	....	.181
Aniline, Oil, drs.............lb.	.13	.14	.12	.14	.11½	.13
Anthraquinone, sub, bbls....lb.	....	.70	...	.70	....	.70
Antimony Oxide, bgs.......lb.	.26	.31	.21	.31	.15	.21¾
Arsenic, whi, bbls, powd....lb.	.06	.08	.05	.08	.04	.05¾

USP $25 higher; Prices are f.o.b. N. Y., Chicago, St. Louis, deliveries ½c higher than NYC prices. *a* Powdered boric acid $5 a ton higher; *b* Powdered citric acid is ½c higher; *c* Yellow grades 25c per 100 lbs. less in each case; *d* Prices given are Eastern schedule.

	Current Low	Current High	1947 Low	1947 High	1946 Low	1946 High
Barium Carbonate precip, wks, bgs.....ton	67.50	82.00	60.00	82.00	60.00	75.00
Chloride, tech, cryst, bgs, zone 1.....ton	80.00	90.00	73.00	95.00	73.00	78.00
Barytes, floated, paper bgs..ton	....	41.95	....	41.95	....	41.95
Bauxite, bulk mines.....ton	8.50	10.00	7.00	10.00	7.00	10.00
Benzaldehyde, tech, cbys, drs.lb.	.45	.55	.45	.55	.45	.55
Benzene (Benzol), 90%, tks, frt all'd.....gal.	....	.19	....	.19	....	.17
Benzyl Chloride, cbys.....lb.	.20½	.23	.20	.23	.20	.24
Beta-Naphthol, tech, bbls, wks.....lb.	.23	.25	.21	.25	.21	.24
Bismuth metal, ton lots.....lb.	....	2.00	....	2.00	1.25	1.80
Blanc Fixe, 66⅝% Pulp, bbls, wks.....ton *h*	55.00	60.00	40.00	60.00	40.00	46.50
Bleaching Powder, wks. 100 lbs.	2.75	3.75	2.50	3.75	2.50	3.60
Borax, tech, c-l, bgs.....ton *i*	48.50	51.00	45.00	51.00	....	45.00
Bordeaux Mixture, bgs.....lb.	.15	.23	.11	.23	.11	.11½
Bromine, cases.....lb.	.21	.23	.21	.23	.21	.23
Butyl, acetate, norm. drs.....lb.	.32½	.33½	.26	.33½	.1860	.26½
Cadmium Metal.....lb.	1.75	1.80	....	1.80	.90	1.55
Calcium, Acetate, bgs..100 lbs.	3.00	4.00	3.00	4.00	3.00	4.00
Carbide, drs.....ton	50.00	90.00	50.00	90.00	50.00	90.00
Carbonate, c-l bgs.....ton	18.00	22.00	18.00	22.00	18.00	22.00
Chloride, flake, bgs, c-l...ton	21.50	38.00	18.50	38.00	18.50	38.00
Solid, 73-75% drs, c-l.....ton	21.00	37.50	18.00	37.50	18.00	37.50
Cy'n'd, min. 21% N, c.l...lb.	.02¼	.02¾	.02¼	.02¾	....	....
Gluconate, USP, bbls.....lb.	.58	.65	.57	.65	.57	.59
Phosphate, tri, bbls, c-l...lb.	....	.0635	....	.0635	....	.0635
Camphor, USP, gran, powd, bbls.....lb.	.77	.79	.77	.82	.69	.82
Carbon Bisulfide, 55-gal. drs..lb.	.05	.05¾	.05	.05¾	.05	.05¾
Dioxide, cyl.....lb.	.06	.08	.06	.08	.06	.08
Tetrachloride, Zone 1, 52½ gal. drs.....lb.	.06½	.07	.06	.07	.69	.80
Casein, Acid Precip, bgs, 10,000 lbs. or more.....lb.	.30	.35	.30	.35	.24	.33
Chlorine, cyls, lcl, wks, contract.....lb.	....	.08¾	....	.08¾	....	.07¼
cyls, c-l, contract.....lb. *j*	...	.06¾	....	.06¾	....	.05¼
Liq. tk, wks, contract. 100 lbs.	....	2.30	....	2.30	....	2.30
Chloroform, tech, drs.....lb.	.20	.23	.20	.23	.20	.23
Coal tar, wks, crude.....bbl.	9.50	10.00	8.25	10.00	8.25	9.00
Cobalt, Acetate, bbl.....lb.	....	.83¾	....	.83¾	....	.83¾
Oxide, black kgs.....lb.	....	1.16	....	1.16	....	1.84
Copper, metal.....100 lbs.	...	21.50	....	21.50	12.00	14.75
Carbonate, 52-54%, bbls..lb.	.26	.26½	.19½	.26½	.19½	.20½
Sulfate, bgs, wks cryst. .....100 lbs.	7.60	8.60	7.10	8.60	5.00	7.25
Copperas, bulk, c-l, wks....ton	....	14.00	....	14.00	....	14.00
Cresol, USP, drs.....lbs.	.13¾	.14¼	.13¾	.14¼	.10¾	.14¼
Dibutylamine, c-l, drs, wks..lb.	....	.76	....	.76	....	.66
Dibutylphthalate, drs.....lb.	.33½	.34½	.29	.34½	.17	.29½
Diethylaniline, drs.....lb.	....	.48	....	.48	....	.48
Diethyleneglycol, drs, wks...lb.	.14	.15	.14	.15	.14	.15
Dimethylaniline, drs, cl., lcl..lb.	.21	.22	.20	.22	.21	.22
Dimethylphthalate, drs.....lb.	.20	.20½	.20	.20½	.20	.20½
Dinitrobenzene bbls.....lb.	....	.16	....	.16	....	.18
Dinitrochlorobenzene, dms...lb.	....	.14	....	.14	....	.14
Dinitrophenol, bbls.....lb.	....	.22	....	.22	....	.22
Dinitrotoluene, drs.....lb.	....	.18	....	.18	....	.18
Diphenyl, bbls, lcl, wks.....lb.	.16	.20	.16	.20	.16	.20
Diphenylamine bbls.....lb.	....	.25	....	.25	....	.25
Diphenylguanidine, drs.....lb.	.35	.37	.35	.37	.35	.37
Ethyl Acetate, syn. 85-90% tks, frt. all'd.....lb.	...	.09½	....	.09½	....	.09½
Chloride, USP, bbls.....lb.	.20	.22	.18	.22	.18	.20
Ethylene Dichloride, lcl. wks, E. Rockies, drs.....lb.	.09	.09½	.0891	.0950	.0842	.0941
Gylcol, dms, cl.....lb.	....	.12	....	.12	....	.10
Fluorspar, No. 1, grd. 95-98% bulk, cl-mines.....ton	....	37.00	....	37.00	....	37.00
Formaldehyde, bbls, cl & lcl..lb.	.0645	.0695	.0520	.0695	.0520	.0570
Furfural tech, drs, c-l, wks...lb.	....	.13	....	.13	....	.13
Fusel Oil, ref'd, drs, dlvd....lb.	.26½	.27½	.18½	.27½	.18½	.19½
Glauber's Salt, Cryst, c-l, bgs, bbls, wks.....100 lbs.	1.25	1.75	1.05	1.75	1.05	1.45
Glycerine dynamite, drs, c-l..lb.	.55¼	.75¾	.55¼	.75¾	.17½	.55¼
Crude Saponification, 88% to refiners tks.....lbs.	.45	.60	.45	.60	....	.60

GUMS

Gum Arabic, amber sorts bgs.lb.	.14½	.15	.13¾	.15	.11¾	.14½
Benzoin, Sumatra, cs.....lb.	.70	.75	.70	1.00	.52	1.70
Copal, Congo.....lb.	no prices		.... no prices			.55¾
Copal, East India, chips....lb.	no prices		.... no prices			.55¾
Macassar dust.....lb.	no prices		.... no prices			.07⅝
Copal Manila.....lb.	no prices		.25	....	.13½	.25
Copal Pontianak.....lb.	no prices		.... no prices			.17⅝
Karaya, bbls, bxs, drs.....lb.	.21	.50	.21	.50	.18	.50

ABBREVIATIONS—Anhydrous, anhyd; bags, bgs; barrels, bbls; carboys, cbys; carlots, c-l; less-than-carlots, lcl; drums, drs; kegs, kgs; powdered, powd; refined, ref'd; tanks, tks; works, f.o.b., wks.

	Current Low	Current High	1947 Low	1947 High	1946 Low	1946 High
Kauri, N. Y.						
Superior Pale XXX......lb.	no prices		....	nom.	....	.65⅝
No. 3..................lb.	no prices		. ..	nom.	....	.22
Sandarac, bgs..............lb.	.90	.95	.90	.95	.90	.99½
Tragacanth, No. 1, cases....lb.	4.50	5.00	5.00	5.25	3.75	5.25
No. 3..................lb.	3.20	3.45	3.20	3.45	2.10	3.45
Yacca, bgs.................lb.	no prices		....	nom.	.05	.07¼
Hydrogen Peroxide, cbys....lb.	.15½	.18½	.15½	.18½	.15½	.18½
Iodine, Resublimed, jars....lb.	....	2.10	....	2.10	1.75	2.10
Lead Acetate, cryst, bbls....lb.	....	.19¼	....	.19¼	....	.16¾
Arsenate basic, bg, lcl.....lb.	.22¾	.23¾	....	.23¾	.12	.18
Nitrate, bbls..............lb.	.17¾	.18	....	.18	....	.12½
Red, dry, 95% Pb_3O_4						
bbls...................lb.	.176	.18½	.14¼	.19¼	.09	.16
97% Pb_3O_4, bbls delv...lb.	.1785*	.18¾	.15	.19½	.09½	.16¾
98% Pb_3O_4, bbls delv...lb.	.181	.19	.15¼	.19¾	.08¼	.17
White, bbls............lb.	.15¾	.16¼	.13	.17¾	.07¼	.14¼
Basic sulfate, bbls, lcl...lb.	.15¼	.15½	.12½	.15½	.07¼	.13¼
Lime, Chem., wks, bulk.....ton	6.50	10.25	6.50	10.25	6.50	10.25
Hydrated, f.o.b. wks.....ton	8.50	12.00	8.50	12.00	8.50	12.00
Litharge, coml, delv. bbls....lb.	.16¼	.17½	.13	.17½	.08	.15¼
Lithopone, ordi., bgs.......lb.	.05½	.06	.03	.06	.04¼	.05¼
Magnesium Carb, tech, wks..lb.	.07¼	.10¼	.07¼	.10¾	.07¼	.10¾
Chloride flake, bbls, wks						
c-l...................ton	....	37.00	....	37.00	....	32.00
Manganese Chloride, Anhyd.						
bbls...................lb.	.14	.16	.14	.16	.14	.18
Dioxide, Caucasian bgs,						
lcl...................ton	74.75	79.75	74.75	79.75	74.75	79.75
Methanol, pure, nat, drs..gal. *l*	.63	.73	.63	.73	.63	.73
Synth, drs cl..........gal. *m*	.34½	.41½	.31	.41½	.24	.38
Methyl Acetate, tech tks....lb.	.06	.07	.06	.07	.06	.07
C.P. 97-99%, tks, delv..lb.	.09½	.10½	.09½	.10½	.09½	110½
Chloride, cyl............lb.	.33	.41	.32	.41	.32	.40
Ethyl Ketone, tks, frt all'd.lb.	....	.09	....	.09	....	.09
Naphtha, Solvent, tks.....gal.	....	.23	....	.23	....	.27
Naphthalene, crude, 74°, wks.						
tks...................lb.	....	.083	....	.083	.0275	.035
Nickel Salt, bbls, NY.......lb.	.14	.14½	.14	.14½	.13	.14½
Nitre Cake, blk...........ton	20.00	24.00	....	24.00	....	16.00
Nitrobenzene, drs, wks......lb.	.08½	.09½	.08	.09½	.08	.09
Orthoanisidine, bbls........lb.	....	.70	....	.70	....	.70
Orthochlorophenol, drs......lb.	.25	.31	.25	.31	.25	.27
Orthodichlorobenzene, drs...lb.	.07½	.08	.07	.08	.07	.08
Orthonitrochlorobenzene,						
wks...................lb.	.15	.18	.15	.18	.15	.18
Orthonitrotoluene, wks, drs..lb.	.08	.09	.08	.09	....	.09
Paraldehyde, 98%, wks lcl...lb.	....	.13	....	.13	....	.12
Chlorophenol, drs........lb.	.25	.29	.24	.29	.24	.27
Dichlorobenzene, wks.....lb.	.12½	.14	.12½	.14	.11	.17
Formaldehyde, drs, wks...lb.	....	.22	....	.22	.21	.22
Nitroaniline, wks, kgs.....lb.	.41	.43	.41	.43	.41	.45
Nitrochlorobenzene, wks..lb.	....	.15	....	.18	....	.18
Toluenesulfonamide, bbls..lb.	....	.70	....	.70	....	.70
Toluidine, bbls, wks......lb.	....	.44	....	.44	....	.48
Penicillin, ampules per						
100,000 units............	....	.21	....	.38	.38	.95
Pentaerythritol, tech.....lb.	.32	.36	.27	.36	.27	.31

PETROLEUM SOLVENTS AND DILUENTS

	Current Low	Current High	1947 Low	1947 High	1946 Low	1946 High
Lacquer diluents, tks,						
East Coast...........gal.	....	.12½	....	.12½	.11½	.12½
Naphtha, East						
tks, wks............gal.	....	.11	....	.11	.11	.12
Rubber solvents, East, tks,						
wks....................gal.	....	.12	....	.12	.11	.12
Stoddard Solvents, East,						
tks, wks..............gal.	....	.12	....	.12	.10	.12

	Current Low	Current High	1947 Low	1947 High	1946 Low	1946 High
Phenol, U.S.P., drs........lb.	.11¼	.13¼	.11¼	.13¼	.10½	.13¼
Phthalic Anhydride, cl and lcl,						
wks...................lb.	.14½	.15½	.14½	.15½	.13	.15½
Potash, Caustics, 88-92%,						
wks, sol..............lb.	.06¾	.07½	.06¼	.07½	.06¼	.06¾
Flake, 88-92%...........lb.	.07½	.08	.07	.08	.07	.07½
liquid, 45% basis, tks...lb.	....	.03⅛	....	.03⅛	....	.02⅞
drs, wks...............lb.	.03¼	.04	.03¼	.04	.03	.03½
Carbonate, hydrated						
83-85%, bbls..........lb.	....	.05¾	....	.05¾	....	.05½
Chlorate crys, kgs, wks...lb.	.11	.13	.11	.13	.11	.13
Chloride, crys, tech, bgs,						
kgs...................lb.	.08	nom.	.08	nom.	.08	nom.
Cyanide, drs, wks........lb.	....	.55	....	.55	....	.55
Iodide, drs..............lb.	1.75	1.78	1.44	1.78	1.44	1.48
Muriate dom, 60-62-63%						
K_2O bulk unit-ton ....unit	....	.53½	....	.53½	.53½	.56½
Permanganate, USP, wks						
drs...................lb.	.22½	.23	.20½	.23	.20½	.21
Sulfate, 90%, basis, bgs..ton	36.25	39.25	36.25	39.25	36.25	39.25
Propane, group 3, tks......gal.	....	.03¾	....	.03¾	....	.03¾
Pyridine, ref., drs..........lb.	.55	.55½	.55	.55½	.45	.55
R Salt, 250 lb. bbls, wks....lb.	....	.72	....	.72	....	.65
Resorcinol, tech, drs, wks...lb.	....	.68	.64	.74	.64	.74
Rochelle Salt, cryst.........lb.	.34½	.35	.34½	.35	.34½	.47
Salt Cake, dom, blk wks....ton	20.00	26.00	....	26.00	....	15.00
Saltpeter, grn. bbls.....100 lbs.	9.00	9.50	8.20	9.50	8.20	9.00

l Producers of natural methanol divided into two groups and prices vary for these two divisions; *m* Country is divided into 4 zones, prices varying by zone. Spot price is ½c higher.

	Current Low	Current High	1947 Low	1947 High	1946 Low	1946 High
Shellac, blchd. bone dry, bbls......lb.	.66½	.72	.66½	.74½	.42½	.74½
Silver Nitrate, bots, 2,500-oz. lots......oz.	.50⅝	.51⅜	.50⅝	.59	.47	.59
Soda Ash, 58% dense, bgs, c-l, wks......100 lbs.	....	1.28	....	1.28	....	1.28
58% light, bgs cl......100 lbs.	....	1.20	....	1.20	1.05	1.20
Caustic, 76% flake drs, cl......100 lbs.	2.90	3.00	2.90	3.00	....	3.00
76% solid, drs, cl......100 lbs.	2.50	2.75	2.50	2.75	....	2.75
Liquid, 47-49%, sellers, tks......100 lbs.	....	2.10	....	2.10	....	2.10
Sodium Acetate, anhyd. drs......lb.	.06½	.10	.06½	.10	.08½	.10
Benzoate, USP drs......lb.	.46	.52	.46	.52	.46	.52
Bicarb, USP, gran., bgs., cl., works......100 lbs.	2.25	2.59	2.25	2.59	1.55	2.59
Bichromate, bgs, wks l.c.l...lb.	.08⅜	.08⅞	.07⅞	.08⅞	.07⅞	.08⅛
Bisulfate powd, bbls, wks......100 lbs.	3.00	3.60	3.00	3.60	3.00	3.60
35° bbls., wks......100 lbs.	1.40	1.65	1.40	1.65	1.40	1.65
Chlorate, kgs, wks c.l......lb.	....	.06½	....	.06½	....	.06¼
Cyanide, 96-98%, drs......lb.	.14½	.15	.14½	.15	.14½	.15
Fluoride, 95%, bbls, drs...lb.	.09¾	.10	.07¼	.10	.07¼	.08¼
Hyposulfite, cryst, bgs, cl, wks......100 lbs.	....	2.25	....	2.25	....	2.25
Metasilicate, gran, bbl, wks c-l......100 lbs.	....	3.40	....	3.40	....	3.40
Nitrate, imp, bgs......ton	....	41.50	....	41.50	33.00	38.50
Nitrite, 96-98% bbl. cl....lb.	....	.06¾	....	.06¾	....	.06¾
Phosphate, dianhyd. bgs, wks......100 lbs.	6.25	7.00	6.00	7.00	6.00	6.75
Tri-bgs, cryst, wks. 100 lbs.	3.50	3.90	2.70	3.90	2.70	3.10
Prussiate, yel. bbls, wks...lb.	....	.12¼	....	.12¼	....	.11
Silicate, 52°, drs, wks...100 lbs.	1.55	2.00	1.40	2.00	1.40	1.80
40°, drs, wks, c-l...100 lbs.	.95	1.15	....	1.15	....	.80
Silicofluoride, bbls, NY...lb.	.07½	.08½	.06½	.08½	.06½	.10
Sulfate tech, Anhyd, bgs......100 lbs.	2.10	2.60	1.70	2.60	1.70	2.20
Sulfide, cryst c-l, bbls, wks......100 lbs.	....	2.90	....	2.90	....	2.40
Solid, bbls, wks......lb.	3.05	4.50	3.05	4.50	3.15	3.90
Starch, Corn, Pearl, bgs. 100 lbs.	5.12	5.27	....	5.27	4.321	6.271
Potato, bgs, cl......lb.	.08	.08¾	.0735	.08¾	.0735	.0760
Rice, bgs......lb.	no stocks		no stocks		no stocks	
Sweet Potato, bgs......lb.	no stocks		no stocks		no stocks	
Sulfur, crude, mines......ton	....	16.00	....	16.00	.. .	16.00
Flour, USP, precp, bbls, kgs......lb.	.18	.36	.18	.36	.18	.36
Roll, bbls......100 lbs.	2.65	3.40	2.65	3.40	2.40	3.40
Sulfur Dioxide, liquid, cyl...lb.	....	.085	.07	.085	.07	.08
tks, wks......lb.	....	.044	....	.044	....	.04
Talc, crude, c-l, NY......ton	....	15.00	....	15.50	....	15.50
Ref'd, c-l, NY......ton	....	17.50	....	17.50	13.00	21.00
Tin, crystals, bbls, wks......lb.	....	.55	....	.55	no stocks	
Metal......lb.	....	.70	....	.70	....	.70
Toluol, drs, wks......gal.	....	.28	....	.28	.27	.32
tks, frt all'd......gal.	....	.23	....	.23	.22	.27
Tributyl Phosphate, drs, lcl. frt all'd......lb.	....	.72	....	.72	....	.65
Trichloroethylene, drs, wks...lb.	.08	.09	.08	.09	.08	.09
Tricresyl phosphate tks......lb.	....	.32	....	.32	....	.32
Triethylene glycol, drs......lb.	.18½	.19½	.18½	.19½	.18½	.19½
Triphenyl Phos., bbls......lb.	.26	.27	.26	.32	.26	.32
Urea, pure, cases......lb.	....	.12	....	.12	....	.12
Wax, Bayberry, bgs......lb.	no stocks		no stocks		no stocks	
Bees, bleached, cakes......lb.	.70	.71	.68	.71	.60	.70
Candelilla, bgs, crude......lb.	.76	.77	.77	.80	.62	.86
Carnauba No. 1, yellow, bgs, ton......lb.	1.68	1.70	1.68	2.00	1.80	2.04
Xylol, Indus., frt all'd, tks, wks......gal.	....	.23	....	.23	..	.26
Zinc Chloride tech, fused, wks......lb.	.06¼	.0655	.05	.0655	.05	.0535
Oxide, Amer., bgs, wks....lb.	.095	.0975	.09	.09¾	.07	.09¼
Sulfate, crys, bgs....100 lbs.	4.15	4.90	3.40	4.90	3.40	4.15

OILS AND FATS

	Current Low	Current High	1947 Low	1947 High	1946 Low	1946 High
Babassu, tks......lb.	no prices		no prices		.11	.12
Castor, No. 3, drs, c.l......lb.	.33¼	.34¾	....	.34¾	....	.29¾
China Wood, drs, spot NY..lb.	.37	.38½	.37	.41	.39	.41
Coconut, edible, drs NY....lb.	no prices		no prices		..	.0985
Cod, USP, bbls, drs......gal.	2.60	3.70	2.60	3.80	2.15	3.80
Corn, crude, tks, wks......lb	.33	.37	.27	.37	...	.27
Linseed ,Raw, drs, c.l......lb.	.3950	.3960	.3580	.3960	.1680	.3640
Menhaden, crude tks......	.23	nom.	.23	nom.	.1220	.21½
Light, pressed, drs l.c.l....lb.	....	.29	....	.29	.1300	.29
Palm, Niger, dms......lb.	no prices		no prices		....	.0865
Peanut, crude, tks, f.o.b. wks. lb	.35	nom.	.28	.37	.12⅞	.28½
Perilla, crude, dms, NY......lb.	no stocks		no stocks		no stocks	
Rapeseed, bulks......lb.	.32	nom.	....no prices		....	.13
Red, dms......lb.	.32¾	.33¾	.29¾	.33¾	.13¼	.30¾
Soy Bean, crude, tks, wks...lb.	..	.29	.26½	.33	.1175	.2450
Tallow, acidless, dms......lb.	.34½	nom	.27	.34½	....	.14¼

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"WE"— EDITORIALLY SPEAKING

SPRING IS HERE, and with it the painters in our office. We were pleased to note the technological strides made by the paint industry since we were young: Then we couldn't go near newly finished woodwork for several days; and now, we were assured, the paint would be dry in half an hour. Consequently, we got very little green paint on our new suit when we accidentally brushed against the door jamb the following morning.

But paint, unfortunately, still smells like paint. We worked heroically in our refurbished office while the females of the species in the general office—near which not a drop of paint had come—were weeping, gnashing their teeth, and wailing for better ventilation.

Come, come, paintmakers! Can't you take pity on the sensitive souls of those who can't stand the smell of your stuff and do something about it?

WE SPENT a busy and pleasant week at the ACS meeting last month, chatting with old friends and strolling along the sunny boardwalk—sunny, that is, a minor proportion of the five days.

At the mixer, especially, we found ourselves getting hep to the solid sending by that musical aggregation of Wilmington chemists, the Rhythm Doctors.

ONE OF OUR FRIENDS in the sulfur business, in response to our query about business conditions, replied, "why, we're just entering our busy season. Sulfur and molasses for spring tonic, you know."

What a perfect sales campaign—we can see it all now! "National Sulfur & Molasses Week," with a syndicated picture of Jane Russell taking the first spoonful. At half a pound of the luscious mixture per capita, sulfur sales would jump 15,000 tons a year.

Free we are giving Hercules Powder and Crosby Naval Stores a tip: "National Goose Grease & Turpentine Week" could be a big thing!

MEDICAL SCIENCE offers proof positive that many diseases which curse mankind can now be controlled and even eradicated. What can you buy from an apothecary, though, to make you prefer the library, the office, or the laboratory bench to a snooze in the sun? The spring fever virus, or whatever it is, has so far failed to attract the attention of our pharmaceutical manufacturers and chemotherapy researchers.

They had better hurry up, too, or we won't get this issue finished!

ONE OF THE SPEAKERS at the annual dinner of the Drug, Chemical and Allied Trades Section of the New York Board of Trade—and he probably doesn't care to be further identified in these august pages, except that he is with Calco—told a story about a druggist's wife who named her pets after items in her husband's store. At the time of this story she had a little Pekinese bitch which she called Peppermint. One night, her husband being out and the weather very bad, she let Peppermint run rather than walking her on a leash. She whistled but the dog didn't come. She didn't come, in fact, until the next morning, when she appeared, wet, bedraggled and weary. Said the mistress, "Why, Peppermint, you bad dog, you've been out all night." Whereupon the dog replied, "Mistress, don't call me Peppermint anymore, call me Horehound."

WE SALUTE *Stars and Stripes,* the Army newspaper which celebrated its fifth birthday last month, but we salute with even more profound respect the chemical ingenuity of its production manager, Sergeant Jim McGowan, who, "needing coal for power, . . . reopened a coal mine. And needing chlorine to bleach the paper, he opened a chlorine mine."

THE ARABS, we learn, refer to DDT as "sleeping powder." We reason from that that without DDT they can't sleep. One would think that after all these centuries they would have achieved a *modus vivendi* with the little fellows that the DDT kills. "Live and let live," or some such agreeable philosophy.

SWORDS INTO PLOWSHARES: A recent traveler in Europe tells us that German oil companies are sawing old Nazi U-boats in half and standing them up on end for use as oil storage tanks.

OUR man-with-his-ear-to-the-ground in the sulfur industry reports a customer's complaint. Said customer seeks a sulfur with a lower melting point.

FIFTEEN YEARS AGO

(From Our Files of May, 1932)

Committee on Unemployment and Relief for Chemists and Chemical Engineers, sponsored by ten leading technical societies and business associations of the industry and assisted by a committee of outstanding leaders, is appealing for funds to relieve dire want of a large number of members of the profession. More than one hundred men are in distress in the metropolitan district. Fifteen hundred more are out of employment.

Lammot du Pont, president of the du Pont Company attacks useless expenditures in government in a public letter sent to "stockholders, employees and friends." . . . Edward C. Franklin, professor emeritus of organic chemistry at Leland Stanford, is awarded the Willard Gibbs Medal for work on liquid ammonia solutions. . . . Wilhelm Ostwald, Nobel prize winner and the recognized founder of the modern science of physical chemistry, dies at 78. . . . Charles K. Davis, former Viscoloid Company president, becomes president of Roessler & Hasslacher. . . . Abalyn, a new resinous plasticizer, is being marketed by the Hercules Powder Company. Properties indicate use in the manufacture of clear lacquers for metals, wood, leather, coating for paper and fabric and non-drying inks.

THIRTY YEARS AGO

(From Our Files of May, 1917)

Thousands of chemists file blanks with Bureau of Mines stating preferences as to war services.

New addition to Eimer & Amend plant will cost $100,000.

John R. Queeny returns from trip to Australia.

Charter of incorporation issued to National Aniline. Capital stock estimated at $17,231,000.

The Essen General Anzeiger says it does not believe the statement that substitutes for German potash have been discovered in the Americas, and this is proved by the crop failures of 1916 and 1917. The newspaper adds: "This is one of the weapons we have to frustrate the Anglo-Saxon attempts to throttle us economically."

MERCK IS SERVING THE INSECTICIDE INDUSTRY AS A BASIC AND PRIME SOURCE OF SUPPLY FOR DDT

An aerial view of the Main Plant of Merck & Co., Inc. at Rahway, N. J.

As expanding facilities come into operation and current commitments are provided for, we are finding increasing opportunities to co-operate with manufacturers of DDT insecticides.

The product we offer is —

DDT

TECHNICAL

(dichloro-diphenyl-trichloroethane)

Setting Point 89° C. Minimum
For Manufacturing Purposes Only

Write us for prices and let us know your requirements. Please address your inquiry to the Insecticide Products Department, Merck & Co., Inc., Rahway, N. J.

DDT TECHNICAL

For the Manufacture of Agricultural, Livestock, Horticultural, and Household Insecticides

MERCK & CO., Inc. RAHWAY, N. J.

Manufacturing Chemists

New York, N. Y. · Philadelphia, Pa. · St. Louis, Mo. · Chicago, Ill. · Elkton, Va.
Los Angeles, Calif. · *In Canada:* MERCK & CO., Ltd., Montreal · Toronto · Valleyfield

Abstracts of U. S. and Foreign Patents

A Complete Checklist Covering Chemical Products and Processes

Printed copies of U. S. patents are available from the Patent Office at 25 cents each. Address the Commissioner of Patents, Washington, D. C., for copies and for general information concerning patents or trade-marks.

Requests for further information or photostated copies of Canadian patents should be addressed to the Commissioner of Patents and Copyrights, Department Secretary of State, Ottawa, Canada.

U. S. Patents from Official Gazette—Vol. 594, Nos. 2, 3, 4—Vol. 595, No. 1. (January 14-February 4)
Canadian Patents Granted and Published February 25—March 18, 1947.

**Organic*

Making chloranil, admixing chlorinated phenol, having chlorine content between 3 and 6 chlorine atoms per molecule, with aqueous sulphuric acid to form mixture capable of being stirred, passing chlorine into mixture while stirring and heating between 90° and 130° C. No. 2,414,008. Francis Alquist, Claude Groom, Jr. and Frederick Haney to The Dow Chemical Co.

Preparing thiuram polysulfides, comprises reacting metal salt of substitut dithiocarbamic acid derived from unsubstituted saturated heterocyclic imine, with sulfur chloride in aqueous medium in presence of mildly alkaline substance in amount to maintain pH of reaction mass between 7 and 11. No. 2,414,014. George Cable and Joseph Richmond to E. I. du Pont de Nemours & Co.

Di-(p-tertiarybutylcyclohexyl) sodium sulfo-succinate. No. 2,414,015. Joseph Carnes to American Cyanamid Co.

Di-(p-secondarybutylcyclohexyl) sodium sulfosuccinate. No. 2,414,016. Joseph Carnes to American Cyanamid Co.

Producing N-alkylated organic compound by hydrogenation in presence of catalyst, mixture of aliphatic nitro compound and aldehyde, improvement comprising conducting hydrogenation in presence of condensing agent of weak organic acid at 15 to 100° C. and 1 to 4 atmospheres. No. 2,414,031. William Emerson.

Copper compound of mercaptan derived from camphene by reacting cuprous salt with mercaptan derived from camphene by reacting camphene with sulfur to form camphene-sulfur complex and hydrogenating camphene-sulfur complex with hydrogen in presence of catalyst. No. 2,414,035. Arthur Fox to E. I. du Pont de Nemours & Co.

Condensing pre-prepared betaine compound containing condensable acid halide group with amine. No. 2,414,050. Adrian Linch to E. I. du Pont de Nemours & Co.

Oily halogen- and sulfur-containing reaction product obtained by reaction of 0.25 mol to 1.0 mol of cardanol alkyl ether and 1.0 mol of sulfur halide between 20° C. and 100° C. No. 2,414,057. Ferdinand Otto to Socony-Vacuum Oil Co., Inc.

Making tetraalkyl compounds of lead, comprises reacting finely-divided lead having non-oxidized surface with at least one compound from ethyl chloride, methyl chloride, ethyl bromide and methyl bromide in presence of iodine catalyst. No. 2,414,058. Howard Pearsall to Ethyl Corp.

Isomerizing diethyl maleate to diethyl fumarate, comprises heating maleate in presence of 2-mercapto-4-methyl thiazole at 140° C. until conversion is complete. No. 2,414,066. Winfield Scott, deceased, by Ruth Scott, executrix to Wingfoot Corp.

Porphyrin purification. No. 2,414,070. Eric Snyder to Wyeth, Inc.

Canadian

Producing beta-(2,5-dimethoxyphenyl)-beta-hydroxyisopropylamine by hydrogenating 2,5-dimethoxy-alpha-isonitrosopropiophenone or salts thereof with the aid of a platinum catalyst. No. 439,450. The Wellcome Foundation, Ltd. (Burroughs Wellcome & Co. (U.S.A.) Inc., Richard Baltzly, Edwin J. de Beer and Johannes S. Buck)

Preparation of an organic ester of a phenolic secondary alkyl amine. No. 439,451. The Wellcome Foundation, Ltd. (Burroughs Wellcome & Co. (U.S.A.) Inc., Johannes S. Buck and Laszlo Reiner)

Method of making a 3,4 diethylcarbonatoester of a 3,4 dihydroxyphenalkyldialkyamine. No. 439,452. Wellcome Foundation, Ltd. (Burroughs Wellcome & Co. (U.S.A.) Inc., Johannes S. Buck and Laszlo Reiner)

Process of preparing N-n-propyl-N-(4-bromo-2-methylphenyl) urea comprising the step of reacting n-proyl-4-bromo-2-methylaniline with nitrourea. No. 439,453. The Wellcome Foundation Ltd (Johannes S. Buck and Edwin J. de Beer)

Salt of 4-chlorocymoxyethoxyethyl-4-chlorobenzyldimethylammonium. No. 439,454 The Wellcome Foundation Ltd. (Johannes S. Buck, Laszlo Reiner and Marion B. Sherwood)

Method of preparing a dialkamine ester of 1-cyclohexylpyrrole-3,4-dicarboxylic acid. No. 439,628. American Cyanamid Company (Donald E. Sargent)

Method of preparing an alkamine ester of a 1-carbocyclic substituted pyrrole-3-carboxylic acid. No. 439,629. American Cyanamid Company. (Theodore F. Scholz).

Method of preparing an alkamine ester of 1-dialkylaminoalkylpyrrole-3,4-dicarboxylic acid. No. 439,630. American Cyanamid Company (Donald E. Sargent).

Method of preparing an alkamine ester of a pyrrole-3-carboxylic acid. No. 439,631. American Cyanamid Company. (Jackson P. Sickels and Theodore F. Scholz)

Process which comprises reacting an N.N'-bis-(chloromethyl)-disulfonamide having at least ten aliphatic carbon atoms with a tertiary amine having not more than one valence of the amino nitrogen attached to aromatic carbon. No. 439,638. Canadian Industries, Ltd. (Donald Drake Coffman and John Carl Sauer)

Reacting methyl hydroxyacetate with vinyl acetate in the presence of mercuric phosphate at 70-100° C. and under anhydrous conditions. No. 439,648. Canadian Industries, Ltd. (Donald Drake Coffman)

(Continued on page 894)

* *U. S. Patents from Vol. 593, Nos. 3, 4, 5, Vol. 594, No. 1. Canadian from Jan. 28—Feb. 18, 1947.*

Patents Available for License or Sale

The Patent Office is regularly publishing a Register of Patents Available for Licensing or Sale. Patents concerning chemical products and processes appear below.

March 18, 1947

2,361,754. **Base Exchange Bodies and the Preparation of the Same.** Patented Oct. 31, 1944. High capacity sulfonated base exchange material for softening water, prepared by sulfonation of phenyl-formaldehyde resinous scrap material with sulfuric acid. Inventor claims product can be regenerated with salt or acid solution without substantial loss of capacity. (Owner) Rolland McFarland, Jr. Address correspondence to Edward H. Lang, 35 East Wacker Drive, Chicago 1, Ill. Group 28—34. Reg. No. 5,231.

2,186,739. **Treatment of Fibrous Materials to Make Them Resistant to Mildew.** Patented Jan. 9, 1940. Composition of various substances, particularly salicyl-anilide, highly effective for long periods of time when applied to fabrics and other materials for protection against mildew. Ingredients and methods are given in patent. Data of manufacture and application thereof available. Has been in use in England. (Owner) F. T. Metcalf, c/o Wilson, Gunn & Ellis, 54/56 Market St., Manchester 1, England. Group 28—89. Reg. No. 5,235.

2,329,910. **Pulverizing Mill.** Patented Sept. 21, 1943. Centrifugal type of impact pulverizing mill for reducing soap, resins, beans, etc. to powder. Machine has cylindrical chamber vertically mounted upon box-like base with hopper and motor at top of chamber. Cylindrical screen is positioned within chamber. Vertical shaft with series of beater arms is mounted for rotation inside screen. Machine has been marketed in England and detailed manufacturing and engineering information are available from owner. (Owner) Stanley Johnson, c/o Wilson, Gunn & Ellis, 54/56 Market St., Manchester 1, England. Groups 28—31; 35—51—59. Reg. No. 5,236.

April 8, 1947

Owens-Corning Fiberglas Corporation is the record owner of twelve patents which relate to glass fibers, glass fiber products, and their manufacture. These patents are registered as Nos. 5,359—5,370, inclusive, and are available for licensing on reasonable terms to any prospective manufacturer who can meet reasonable requirements of financial responsibility.

The Owens-Corning Fiberglas Corporation is the record owner of the following two patents on inventions which are not directly usable for the manufacture of glass fibers, but which cover the use of glass fibers or glass fiber products in various types of manufactured articles or equipment. These patents are registered as Nos. 5,371 and 5,372 and are available for royalty-free licensing to any prospective manufacturer making request therefor upon payment of a five dollar application fee for each patent.

2,403,872. **Treatment of Glass Fibers.** Patented July 9, 1946. Making glass fiber reinforced resinous articles which includes preliminarily sizing glass fiber fabric with unreacted resin-forming substances and drying fabric at temperature insufficient to completely react substances. Groups 28—51—83; 32—29.

2,404,904. **Bonding Glass Fabrics to Inorganic Solids.** Patented July 30, 1946. Bonding glass fabrics to inorganic bodies such as metal plates by means of superposed layers of vitreous enamels. Groups 28—11; 32—29.

Detailed information may be obtained from Carl G. Staelin, Secretary, Owens-Corning Fiberglas Corporation, Toledo 1, Ohio.

2,206,919. **Scale for Compounding Formulas and Other Purposes.** Patented July 9, 1940. Group 35—74. Reg. No. 5,393.

2,360,384. **Weighing Scale.** Patented Oct. 17, 1944. Group 35—74. Reg. No. 5,394.

The above two patents relate to a scale for compounding a mixture in definite proportions and in proper sequence. Comprises a pedestal with a removable tray at one end. An indicium plate at other end is detachably mounted in slots in scale-beam. Top edge of plate has a series of notches proportioned to the weights of ingredients. The plates are interchangeable and have formulas printed on both sides. Weight is moved along the plate and balanced by material poured into the tray. May be used for different systems of weight such as metric, troy, or avoirdupois. (Owner) Frederick W. Quidas, 615 Third Ave., New York 16, N. Y.

*Packaging

Paper liner facing material comprising paper base and coating thereon comprising paper-adherent layer of oleoresinous varnish sealing paper base and providing continuous outward surface, and continous top coating film having unplasticized resinous base consisting for 80 to 100 percent by dry weight of vinyl polymer resin, etc. No. 2,412,592. Curtis Maier to Continental Can Co., Inc.

Liquidproof fiberboard carton with bellows closure. No. 2,412,666. Julius Zinn, Jr.

Vacuum seal package. No. 2,412,794. William White to White Cap Co.

In combination with large bottle having threaded neck and small bottle having threaded neck and shouldered portion adjacent threaded neck, dispensing cap comprising elongated body member open at lower end and formed with internal threads at lower end, etc. No. 2,412,833. Martin Prager.

Hermetically sealing end of flexible tubular bag or liner. No. 2,412,862. Samuel Bergstein to Robert Bergstein and Frank Bergstein, trustees.

Apparatus for sealing containers. No. 2,412,924. Harry Stover to Anchor Hocking Glass Corp.

Coated liner for interior of fibrous package consisting of talc, kaolin, protein, caustic soda, glycerine, water. No. 2,413,007. Alfred Srere to The Miami Valley Coated Paper Co.

Metal container having lining of thin, continuous film comprising major portion of film-forming resinous varnish having Aruba resin therein. No. 2,413,093. Albin Warth and Oliya Bulatkin to Crown Cork & Seal Co., Inc.

Collapsible container for pastes formed from water-resistant thermoplastic flexible resin containing plasticizer having seamless hollow tubular body. No. 2,413,323. George Hills.

Shipping and dispensing container comprising body having projecting threaded neck tapered nozzle, threaded cap having central opening and removably threaded onto neck with nozzle projecting into body, etc. No. 2,413,438. Gabriel Doose.

Method of making sealed fiber containers and closures therefor. No. 2,413,449. Alexander Hatch to Continental Can Co., Inc.

Pressure operated valve for filling containers. No. 2,413,916. Mervil Hallead to The Karl Kiefer Machine Co.

*Paints, Pigments

Preparation of varnish bases, comprises bodying varnish base material comprising fatty oil to viscosity such that it will vulcanize to irreversible gel upon being heated at 160° C. with 4.5% sulfur in less than four hours, etc. No. 2,413,281. Laszlo Auer.

Producing finely divided alkaline earth metal sulfite for use as pigment material, comprises subjecting lumps of alkaline earth metal carbonate to simultaneous action of attrition, acid sulfiting agent, and sufficient water, etc. No. 2,413,321. Gerald Haywood and Wright Welton to West Virginia Pulp & Paper Co.

Producing pigment-useful anhydrite calcium sulfate, comprises mixing aqueous suspension of calcium compound with strong sulfuric acid, interrupting mixing operation for short period after not less than 5% nor more than 50% of calcium compound has been mixed, continuing until all of calcium compound has been mixed and reacted. No. 2,413,799. Roy Sullivan to E. I. du Pont de Nemours & Co.

*Paper, Pulp

In manufacturing paper, by means of cylinder mold type machine, improvement includes mixing components of paper stock and whitewater by injecting one of components into other at point where one component is at maximum velocity; pumping mixed stock upwardly with progressively decreasing velocity and increasing cross-sectional area to quiescent, free stock surface, etc. No. 2,412,771. Philip Goldsmith.

Structure having laminated body formed from layers of paper united by films of adhesive. No. 2,413,500. Fred Hummel to Hummel-Ross Fibre Corp.

Forming and bleaching groundwood, comprises abrading wood under conditions causing generation of substantial heat by friction at point of abrasion, applying substantially at such point bleaching agent selected from alkaline solutions of hydrogen peroxide and solutions of alkali metal peroxides. No. 2,413,583. Russell Shearer to St. Regis Paper Co.

*Petroleum

Apparatus for simultaneously measuring along borehole two physical properties of formations traversed thereby comprising bomb adapted to be lowered in borehole, cable for suspending bomb carrying electrical conductor, generator of carrier wave arranged in bomb having its output connected to conductor, means disposed at surface and connected to conductor for recording output of generator, etc. No. 2,412,575. Alex Frosch to Standard Oil Development Co.

Pressure treating of hydrocarbons, comprises subjecting naphtha in presence of hydrogen in partial pressure of 50-300 pounds per square inch, at 850-1200° F., to action of contact mass consisting of aluminum, chromium and molybdenum gel type oxides. No. 2,412,600. Robert Burk and Everett Hughes to The Standard Oil Co.

Producing aviation gasoline. No. 2,412,645. John Munday to Standard Oil Development Co.

Recovering carbon and sulfur values from acid sludge produced by treatment of petroleum hydrocarbon with sulfuric acid comprises maintaining quantity of hot finely divided coke within coking zone, passing gasiform fluid upwardlly through zone at rate to maintain coke in dense turbulent suspended phase, continually supplying hot finely divided coke to zone, introducing acid sludge into zone, etc. No. 2,412,667. Maurice Arveson to Standard Oil Co.

Isomerization process comprises subjecting isomerizable saturated hydrocarbon to catalytic isomerization in reaction zone containing solid packing material and maintained under isomerizing conditions, maintaining in catalyst supply zone bed of fresh Friedel-Crafts metal halide catalyst not previously used in reaction zone, etc. No. 2,412,675. Joseph Danforth to Universal Oil Products Co.

Regenerating spent powdered catalyst in which powdered catalyst is suspended in free-oxygen-containing gas and passed through regeneration zone, improvements comprise suspending hot, recently regenerated catalyst in free-oxygen-containing gas, cooling last-named catalyst suspension, intermixing suspension of regenerated and suspension of spent catalyst, discharging mixture into regeneration zone, etc. No. 2,412,696. Jackson Schonberg and Donald Campbell to Standard Oil Development Co.

Removal of small amounts of dissolved hydrogen fluoride and high-boiling organic fluorine compounds from liquid hydrocarbon mixture comprising low-boiling and high-boiling hydrocarbons and fluorine-containing impurities. No. 2,412,726. Frederick Frey to Phillips Petroleum Co.

Producing petroleum oil from partially depleted wells including steps of injecting condensable hydrocarbon vapors consisting of propane and butane at atmospheric temperature and at maximum pressure only slightly higher than vapor pressure of propane at formation temperature into partially depleted oil producing formation, permitting injected vapors to condense completely within pores of formation, etc. No. 2,412,765. Edward Buddrus and Samuel Carney to Phillips Petroleum Co.

Removing water-dispersible impurities from oil, includes continuously mixing with stream of oil stream of fresh water to form stream of artificial oil-continuous emulsion, dividing resulting stream into plurality of separate streams, establishing plurality of separated high-intensity coalescing electric fields in plurality of separated settling spaces disposed at same level, etc. No. 2,412,791. Logan Waterman to Petrolite Corp., Ltd.

Extracting aromatic hydrocarbons from feed hydrocarbon mixtures of aromatic and non-aromatic hydrocarbons. No. 2,412,828. Ernest Naragon to The Texas Co.

Manufacture of liquid hydrocarbons suitable for motor fuel. No. 2,412,837. James Rose to Potomac Hydrocarbon Process Corp.

Catalyzing feed stream of mixed hydrocarbons by means of liquid acid catalyst comprises: establishing succession of zones of contact between bodies of catalyst and hydrocarbon stream; passing stream through zones successively, stream entering lower portion of each zone at velocities sufficient to ensure turbulence therein, etc. No. 2,412,863. John Bolinger and Paul Prutzman to Socony-Vacuum Oil Co., Inc.

Catalytic cracking of hydrocarbon oils in presence of steam-sensitive catalyst wherein catalyst is alternately subjected to cracking and regeneration and wherein catalyst is exposed to action of steam during operation, maintaining activity of catalyst comprises introducing ammonia into zone in which catalyst is initially exposed to steam. No. 2,412,868. Cecil Brown to Standard Oil Development Co.

Converting thermally relatively heavy petroleum oil residual into vaporizable hydrocarbons containing substantial quantities of gas oil and coke-forming constituents. No. 2,412,879. Herbert Fischer to Standard Oil Development Co.

Pressure retaining coring assembly for bringing core to surface of ground at same pressure core left formation. No. 2,412,915. Benjamin Sewell to Standard Oil Development Co.

Converting hydrocarbon oil comprises passing oil in vapor phase and at conversion temperature into contact with compact downwardly moving mass of particle-form, clay-type, solid catalytic material in which conversion is effected, etc. No. 2,412,917. Thomas Simpson, John Payne and John Crowley, Jr., to Socony-Vacuum Oil Co., Inc.

Conversion of heavy hydrocarbon liquid having boiling point of at least 350° C., containing unsaturated compounds, into valuable hydrocarbons of high molecular weight and mainly of more saturated nature than heavy hydrocarbon liquid. No. 2,412,983. Emil Hene.

Alkylation process in which emulsion of reactive hydrocarbons and strong mineral acid is maintained and circulated in system comprising reaction zone and primary settling zone, settling emulsion entering primary zone to form upper layer of emulsion of reactive hydrocarbons and lower layer richer in acid, etc. No. 2,413,105. George Hatch, Ernest Pevere, Louis Clarke, and Frank Bruner to The Texas Co.

High-compression motor fuel. No. 2,413,262. Robert Stirton to Union Oil Co. of California.

Catalytic treatment of hydrocarbons. No. 2,413,271. Halsted Warrick to The Texas Co.

Recovery of oil from subterranean oil-bearing formation, comprises subjecting formation to action of Desulfovibrio halohydrocarbonoclasticus. No. 2,413,278. Claude Zobell to American Petroleum Institute, and dedicated to the public throughout the world by said Institute.

Recovery of hydrocarbons from sludge formed by treatment of hydrocarbons with metallic halide catalyst comprises commingling sludge with aqueous hydrolyzing medium and low boiling inert hydrocarbon liquid, hydrolyzing sludge with hydrolyzing medium, refluxing hydrocarbon liquid during hydrolyzing step, etc. No. 2,413,310. Herman Bloch to Universal Oil Products Co.

Contacting finely divided siliceous filter aid selected from diatomaceous filter aids, tripoli, and finely ground silica, with acid-treated oil containing preformed pepper sludge in dispersion, dissolved sulfur dioxide, and oil-soluble sulfonic acids having combining weight of at least 400. No. 2,413,311. Charles Cohen to Standard Oil Development Co.

Catalytic finishing of sulfur-containing olefinic gasolines comprises treating gasoline in presence of excess of hydrogen and suf-active hydrogenation catalyst at 400° F. and 825° F. under conditions chosen to effect partial desulfurization and to hydrogenate minor part of olefins, etc. No. 2,413,312. Robert Cole to Shell Development Co.

Preparing branched paraffinic hydrocarbons containing at least 6 carbon atoms per molecule comprises reducing alkyl halide containing at least 6 carbon atoms per molecule by reacting alkyl halide with isoparaffinic hydrocarbon containing not more than 5 carbon atoms per molecule in presence of catalytic amount of metal halide of the Friedel-Crafts type, etc. No. 2,413,384. Louis Schmerling to Universal Oil Products Co.

Cracking hydrocarbons, wherein cracking is effected in presence of diluent gas or vapor while hydrocarbons are passing down cracking chamber in form of self-supporting helical stream and wherein part at least of diluent gas or vapor is introduced at point below point of introduction of hydrocarbon, etc. No. 2,413,407. Henry Dreyfus; Claude Bonard administrator of Henry Dreyfus, deceased.

In determining fluid permeability and elevation of earth formations penetrated by well bore, steps which comprise introducing into well first liquid in amount sufficient to fill well to point above formations to be measured; introducing into well second liquid having lower density than first and immiscible therewith, continuing introduction of second liquid at known rate to force first liquid out of well into adjacent formations while ascertaining rate of descent of interface, etc. No. 2,413,435. Leo Courter to The Dow Chemical Co.

Highly refined Diesel type fuel otherwise deficient in lubricating quality containing small proportion of lubricity agent soluble in fuel. No. 2,413,482. Benjamin Anderson and Marcellus Flaxman to Union Oil Co. of California.

Separating desirable constituents from condensate well gaseous effluent within range of 3000-6000 pounds per square inch. No. 2,413,503. Donald Katz to Phillips Petroleum Co.

Alkylating paraffins to form other paraffins of higher molecular weight, comprises inter-reacting alkylatable paraffin hydrocarbon and alkyl halide in presence of concentrated sulfuric acid containing aluminum sulfate as alkylating catalyst. No. 2,413,759. Frederick Frey to Phillips Petroleum Co.

Alkylating isoparaffinic hydrocarbons with olefinic hydrocarbons in contact under alkylating conditions with catalyst comprising concentrated sulfuric acid modified with alkyl derivative of oxy-acid of phosphorus, catalyst containing less than 10% water. No. 2,413,777. Eugene Oakley and Lloyd Brooke to California Research Corp.

Treating hydrocarbon materials to remove organically combined fluorine, comprises subjecting hydrocarbon material containing minor amount of organically combined fluorine to action of product resulting from treating with solution of hydrogen fluoride in liquid paraffinic hydrocarbon stream, hydrous oxide of aluminum. No. 2,413,868. Frederick Frey to Phillips Petroleum Co.

Removing organically combined chlorine from hydrocarbons, comprises treating with alumina and quicklime to effect decomposition of major proportion of organic chlorine compounds to form hydrogen chloride

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* *U. S. Patents from Vol. 593, Nos. 3, 4, 5, Vol. 594, No. 1.*

and combination with quicklime. No. 2,413,871. Harold Hepp to Phillips Petroleum Co.

Extracting weakly acidic substances from hydrocarbon distillates, comprises contacting distillates with aqueous solution of alkali metal hydroxide and solutizer comprising alkali metal salt of carboxy ether containing 3 to 8 carbon atoms. No. 2,413,938. Chester Adams and Theodore Tom to Standard Oil Co.

Treating petroleum distillates. No. 2,413,945. John Bolt to Standard Oil Co.

Method of regenerating incombustible solid particles susceptible to damage at high temperature, by burning combustible contaminants therefrom, comprises maintaining dense bed of solid particles in two confined combustion zones in series, supplying independent stream of oxidizing gas to each of beds to effect burning of combustible contaminants, etc. No. 2,414,002. Charles Thomas and John Pinkston, Jr. to Universal Oil Products Co.

Canadian

Well drilling mud, comprising a dispersion of clay and weighting material in an aqueous solution of an alkalimetal tripolyphosphate. No. 439,420. Hall Laboratories, Inc. (George B. Hatch)

*Photographic

Permeating and fixing photographic element includes non-gelatin layer having slight permeability to normal fixing solutions and containing developed silver image comprises immersing photographic element in bath which contains as essential fixing constituents of water soluble simple salt of hydrogen iodide and member of group consisting of thiourea and soluble thiocyanate. No. 2,412,674. John Crabtree and George Eaton to Eastman Kodak Co.

Preparing dry particles of photographic silver halide emulsion comprises preparing silver halide emulsion, setting emulsion, shredding set emulsion, washing shredded emulsion, reshredding emulsion, soaking in organic dehydrating liquid, removing liquid, and drying particles. No. 2,413,207. Thomas Baker to Dacrematt, Ltd.

Photographic method of producing reticles comprising coating transparent body with light sensitive, ammonium bichromate, gelatin, and glue composition, exposing coating to light projected image of fine lines to effect reproduction of lines on transparent body, etc. No. 2,413,600. Everett Bierman to Semagraph Co.

Producing iodine image comprises providing suspension of at least one photosensitive ferric salt in permeable, relatively water-insoluble carrier, etc. No. 2,413,630. Helen Husek to Polaroid Corp.

Canadian

Process for reducing the tendency of a sensitizing dye to wander from a dye-sensitized photographic silver halide emulsion. No. 439,532. Canadian Kodak Co., Ltd. (Edward Bowes Knott)

*Polymers

Alkylating resinified material derived by resinifying aromatic hydrocarbon with aldehyde, with alkylating agent containing less than 7 carbon atoms, at 125° F. with Friedel-Crafts catalyst, hydrolyzing and removing catalyst and distilling reaction product under reduced pressure to 600° F. to obtain desired product as distillation residue. No. 2,412,589. Eugene Lieber to Standard Oil Development Co.

Brush for electrical machinery comprising conductive carbonaceous body impregnated with polyalkylene oxide of average molecular weight greater than 400. No. 2,412,701. Edward Williford to National Carbon Co., Inc.

Heteropolymer comprising in combination 50 to 98 parts by weight of olefin having 3 to 5 carbon atoms and one ethylenic double bond per molecule with 2 to 50 parts by weight of ether having 4 to 8 carbon atoms and two isolated ethylenic double bonds per molecule. No. 2,-412,921. William Sparks and Robert Thomas to Standard Oil Development Co.

Dry casting solution consisting of acetone soluble cellulose acetate, dibutyl phthalate, ethyl cellulose, and acetone. No. 2,412,947. Gilbert Brant to E. I. du Pont de Nemours & Co.

Solution in organic solvent of copolymer of tetrafluoroethylene and ethylene containing from 50% to 85% tetrafluoroethylene, solvent being neutral ester of saturated dicarboxylic acid containing at least 5 carbon atoms, ester being free of multiple carbon to carbon linkages containing from 7 to 18 carbon atoms. No. 2,412,960. Kenneth Berry to E. I. du Pont de Nemours & Co.

Thermoplastic casting composition suitable to be melted and poured into molds to form tools, dies, and jigs comprising ingredients: ethyl cellulose, plasticizer, thermoplastic resin, wax. No. 2,413,011. Waldorf Traylor and David Wiggam to Hercules Powder Co.

Aqueous dispersions of vinyl-acetate polymers. No. 2,413,197. Joseph Smith and William Drummond to E. I. du Pont de Nemours & Co.

Brush bristle block formed of 17.5% wood flour, 7% of plasticizer for polystyrene, and 5% of pigment. No. 2,413,219. Gaetano D'Alelio to Pro-phy-lac-tic Brush Co.

Plastic composition of polyvinyl ester and wax. No. 2,413,239. George Manson to Shawinigan Chemicals, Ltd.

Polyamines and process for preparing. No. 2,413,248. Murray Senkus to Commercial Solvents Corp.

Polystyrene-type resins plasticized with high boiling fatty acid alkyl esters. No. 2,413,258. Frank Soday to The United Gas Improvement Co.

Polyacrylic and polymethacrylic resins plasticized with high boiling aromatic oils. No. 2,413,259. Frank Soday to The United Gas Improvement Co.

Acetalizing polyvinyl compound with aldehyde, improvement comprises conducting acetalization under anhydrous conditions in presence of catalyst selected from maleic acid and maleic anhydride, maleic compound also acting as esterifying agent. No. 2,413,275. Frank Wilson, Gustavus Esselen, and Gaetano D'Alelio to Pro-Phy-Lac-Tic Brush Co.

Composition of matter containing polymeric substance derived from monomer selected from methyl methacrylate, styrene, vinyl acetate and vinyl chloride, and solvent therefor selected from chavicol, methyl chavicol, eugenol, eugenol methyl ether, safrole, iso-chavicol, anethole, iso-eugenol, iso-eugenol methyl ether, iso-safrole. No. 2,413,294. David Curtis.

Film forming emulsion comprising water immiscible phase and aqueous phase, aqueous phase containing water dispersible polyhydroxylated film forming substance capable of being converted to water insoluble film by drying in presence of antimony compound active to convert film forming substance to less soluble form when dried in association therewith. No. 2,413,320. Ira Griffin, Dave Truax and Norman Nuttall to Stein, Hall & Co., Inc.

Forming resinous plastic material comprising heating body of rosin to 450°F.-550°F., introducing into heated body solid lignocellulosic material. No. 2,413,326. Frederick Kressman and Frederick Kressman, Jr., one-half to Continental Turpentine & Rosin Corp., Inc.

Preparing oil-modified resinous composition comprises reacting at 115°C. to 215°C. normally oil-insoluble, dehydrated Novolak phenol-aldehyde resin with fatty material selected from fatty oils, oxidized fatty oils, heat-polymerized fatty oils, dehydrated fatty oils, hydrogenated fatty oils and fatty acids having at least 7 carbon atoms in presence of acidic catalyst selected from hydrates of phosphorus pentoxide, dialkyl sulphates, sulphur trioxide. No. 2,413,412. Arthur Mazzucchelli to Bakelite Corp.

Preparing organic solvent soluble allyl starch comprises allylating starch in presence of concentrated alkaline solution and organic solvent for allyl starch. No. 2,413,463. Peter Nichols, Jr., Philip Meiss, and Elias Yanovsky to the Secretary of Agriculture of the United States of America.

Obtaining shaped articles from tetrafluoroethylene polymer comprises mixing polymer with another organic film-forming material which decomposes at temperature of from 350°C. to 500°C. No. 2,413,498. Julian Hill to E. I. du Pont de Nemours & Co.

Unsaturated polyhydric alcohols having structure of heat polymerized fatty acids with primary alcohol groups in place of carboxyl groups of said acids. No. 2,413,612. Eddy Eckey and James Taylor to The Procter & Gamble Co.

Esters of unsaturated polyhydric alcohols with unsaturated fatty acid polymers, said alcohols having structure of heat polymerized fatty acids with primary alcohol groups in place of carboxyl groups of said acids. No. 2,413,613. Eddy Eckey and James Taylor to The Procter & Gamble Co.

Hardenable condensation product of urea and aldehyde intimately mixed with curing catalyst which is selected consisting of ammonium silicofluoride and ammonium borofluoride. No. 2,413,624. Raymond Harris to American Cyanamid Co.

Electrical conductor in combination with insulating layer comprising plasticized polymer made largely from vinyl chloride, and lead acetate. No. 2,413,673. William Sears to The B. F. Goodrich Co.

Resinous composition obtained by heating between 90° C. and 120° C. linear polyamide forming composition comprising primary diamine-dicarboxylic salt, monohydric alcohol, formaldehyde, and material selected from urea, guanidine and amino triazine. No. 2,413,697. Donald Edgar to E. I. du Pont de Nemours & Co.

Preparing resinous material comprising heating polymer comprising alpha-halogenacrylic acid units, in presence of alcohol selected from primary monohydric and secondary monohydric alcohols. No. 2,413,716. William Kenyon and Louis Minsk to Eastman Kodak Co.

Improving water resistance of shaped articles of polyvinyl alcohol, comprises heating articles in contact with aqueous solution of strong base containing at least 15% by weight of base, and air at temperature from 50° to 90° C., whereby articles are rendered permanently insensitive to water below 50° C. No. 2,413,789. Robert Scheiderbauer to E. I. du Pont de Nemours & Co.

Forming thin tubular shell of plastic material such as flashlight barrel with medium disposed along inner surface to act as shock absorbing device preventing breaking of plastic material without causing shrinkage marks to form. No. 2,413,823. Jules Gits, to himself and Joseph Gits.

Resinous composition consisting of 50 lbs. smilax resin, 3 lbs. zinc oxide, 0.25 lb. stearic acid, 0.25 lb. mercaptobenzothiazole, 1.75 lbs. sulphur, mixed and vulcanized at 260 degrees F. for sixty minutes in mold. No. 2,413,842. David Muir.

Plasticized resinous product comprising vinyl compound selected from vinyl chloride homopolymers, vinyl chloride-vinyl acetate copolymers, vinyl chloride-vinylidene chloride copolymers, vinyl butyral polymers, and tetra-ester of ethylene diamine tetraacetic acid. No. 2,413,856. Frederick Bersworth.

Thermoset resin obtained by heat-curing composition comprising mixture of condensation product of formaldehyde with amino compound selected from urea, thiourea, and melamine, and, as flow promoter, glyceryl monoether of monohydroxy aromatic compound containing benzene ring, having no more than seven carbon atoms. No. 2,413,860. Alfred Brookes to American Cyanamid Co.

Production of benzene-soluble copolymer from piperylene and indene, comprises contacting mixture containing piperylene and indene with 0.1% to 10% by weight of total reactants of acid-acting metallic halide catalyst at between -60 and 145° C., recovering benzene-soluble resinous copolymer of piperylene and indene. No. 2,413,893. Frank Soday to The United Gas Improvement Co.

Photopolymerization of vinyl and vinylidene compounds. No. 2,413,973. Benjamin Howk and Ralph Jacobson to E. I. du Pont de Nemours & Co.

Plasticized composition composed of copolymer of vinylidene chloride and vinyl chloride formed from 10 to 25 per cent vinylidene chloride and 90 to 75 per cent vinyl chloride, plasticized with bis (carboalkoxy) diethyl ether the alkoxy groups having one to eight carbon atoms. No. 2,414,022. Albert Clifford and Joy Lichty to Wingfoot Corp.

Thermosetting composition comprising urea-formaldehyde reaction product and dibenzyl oxalate as latent curing catalyst. No. 2,414,025. David Cordier to Libbey-Owens-Ford Glass Co.

Polymeric materials. No. 2,414,028. Melvin Dietrich and James Kirby to E. I. du Pont de Nemours & Co.

Canadian

Denture comprising a solid translucent polyurethane as obtainable by reacting an aliphatic diisocyanate with a glycol. No. 439,474. I. G. Farbenindustrie Aktiengesellschaft (Heinrich Rinke and Paul Weikart).

Forming an aqueous acidic emulsion of a vinyl aromatic compound which contains a water-soluble peroxide, and heating the emulsion to polymerize the vinyl aromatic compound. No. 439,544. The Dow Chemical Company (Edgar C. Britton and Walter J. Lefevre).

Fibrous sheet material having deposited on its fibres a copolymer of butadiene-1,3 and styrene in which the proportion of butadiene to styrene by weight is within the range from 50:50 to 70:30. No. 439,557. Latex Fiber Industries, Inc. (Allen Fulton Owen).

Process for obtaining an improved polyamide composition from a mixture of a plurality of different polyamides. No. 439,640. Canadian Industries, Ltd. (Leroy Frank Salisbury).

Process of obtaining polymeric products from 1,3-dioxolane and butadiene. No. 439,645. Canadian Industries, Ltd. (Donald John Loder and William Franklin Gresham).

Process for polymerizing tetrafluoethylene by contacting it at a temperature of 0° to 200°C. under a pressure of at least one atmosphere with water. No. 439,646. Canadian Industries, Ltd. (Merlin Martin Brubaker).

Polymerizing tetrafluorethylene by heating under pressure at a temperature of from 55° to 240°C. in the presence of water and a catalyst of the group consisting of oxygen and organic peroxy compounds. No. 439,647. Canadian Industries, Ltd. (Robert Michael Joyce, Jr.).

Method for preparing sulphur-containing esters of hydrolyzed interpolymers of ethylene with a vinyl ester of an organic carboxylic acid. No. 439,649. Canadian Industries, Ltd. (William Henry Sharkey).

Polymer of ethylene with a vinyl thiolester of an organic carboxylic acid. No. 439,650. Canadian Industries, Ltd. (Merlin Martin Brubaker).

Flexible article coated with a film of N-alkoxymethyl polyamide. No.

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439,652. Canadian Industries, Ltd. (Boynton Graham and Howard Sinclair Turner).

Ether of a polymeric polyhydric alcohol with a 3-hydroxythiolane-1-dioxide. No. 439,654. Canadian Industries, Ltd. (William August Hoffman and Carl Walter Mortenson).

*Processes and Methods

Dissolving solute comprises maintaining supply of solute to fill inner two of three spaced and concentrically nested conical vessels, introducing solvent within apex zone of innermost vessel at rate that solvent will agitate solute in apex zone but will become saturated in innermost vessel, overflowing solution into solute-filled annular space between two inner vessels, passing solution downwardly within space and upwardly within annular space defined by third vessel, etc. No. 2,412,560. Frank Bolton.

Analyzing solutions comprises confining solution under observation between pair of interferometer plates, subjecting solution there between to electrophoresis, passing rays of monochromatic light through solution, recording interference pattern produced by interferometer plates for determining characteristics of solution. No. 2,412,602. Leslie Chambers and Haldan Hartline to The Trustees of the University of Pennsylvania.

Fluid medium storing and dispensing system. No. 2,412,613. Harry Grant, Jr., to Specialties Development Corp.

Making laminar articles having coating on one face thereof from hard and brittle material shapable by abrasives comprises forming flat smooth face on body of material, coating face so formed, cutting off coated slice of material by cut parallel to face, coating face of body with tough and fracture resisting substance, etc. No. 2,412,644. John Muller to Western Electric Co., Inc.

Detecting free hydrogen in submarine atmospheres which contain catalyst poisons such as stibine and arsine as well as free hydrogen, all produced by electric storage batteries used on submarine, comprises passing continuously flowing stream of atmosphere from battery compartment of submarine through heating zone, heating gases in zone under non-catalytic conditions to temperature high enough to decompose any stibine and arsine contained in stream but below temperature at which free hydrogen would be caused to react with oxygen in atmosphere, passing stream of atmosphere from heating zone in continuous stream into and through combustion zone in contact with hot catalytic wire leg of Wheatstone bridge, etc. No. 2,412,827. John Morgan and Alan Sullivan to Cities Service Oil Co.

Removing cations from fluids containing same comprises bringing cation-containing fluid into contact with infusible cation-sorbing resin and separating resin and fluid. No. 2,412,855. Robert Auten and Donald Herr to The Resinous Products & Chemical Co.

Process for manufacture of crystalline absorbents. No. 2,413,134. Richard Barrer.

Purification of gases by removal of liquid or solid particles suspended therein. No. 2,413,324. Hans Holzwarth to Holzwarth Gas Turbine Co.

Drying material comprising passing material to be dried through opening in convex surface, directing high velocity jet of elastic fluid to wipe, subsequently to its formation, over convex surface in direction in which surface has substantial curvature and in vicinity of opening so that stream of fluid breaks from curvature of surface adjacent opening to entrain and form dispersion of material in fluid from jet. No. 2,413,420. Nicholas Stephanoff to Thermo-Plastics Corp.

Mixing granular hydroscopic salt with moisture-proofing agent consisting of spreading oil of low volatility having spreading pressure in excess of 20 dynes per centimeter, and paraffin wax. No. 2,413,491. Edgar Fajans to Imperial Chemical Industries, Ltd.

Separator for plurality of immiscible liquids comprising receiving tank, means for drawing vacuum on receiving tank, discharge mechanisms which are so constructed as to remove each of said liquids from receiving tank for delivery to any desired point, etc. No. 2,413,509. Coyne Lord.

Measuring vapor pressure in gas. No. 2,413,565. Clarence Hewlett to General Electric Co.

Purifying acidic convertor liquor containing dextrose and non-sugar impurities including trace of iron and copper, organic impurities and quantity of free acid, by removing iron and copper by passing solution through bed of hydrogen exchange material prior to treatment with acid-adsorbing resin. No. 2,413,676. Abraham Behrman, Hilding Gustafson and James Hesler to Infilco, Inc.

Producing oil from oil-containing coagulable animal tissue material, comprises coagulating material, draining free water, comminuting sufficiently to rupture cells and liberate oil into comminuted mass without producing emulsion, adding water to cause oil yields from cells to float on comminuted mass. No. 2,413,692. Harold Crowther to Aquacide Co.

Separating constituents of gaseous mixtures by liquefaction and rectification, comprises compressing and cooling the gaseous mixture, liquefying portion of mixture by heat exchange with separated constituent, expanding the remaining portion with external work, scrubbing expanded portion with the liquefied portion to remove impurities, etc. No. 2,413,752. Wolcott Dennis to Air Reduction Co., Inc.

Ionic exchange operations. No. 2,413,784. Franklin Rawlings and Louis de Geofroy to The Dorr Co.

Fractionation of solutes. No. 2,413,791. Ralph Shafor to The Dorr Co.

Drying peat and other aqueous materials. No. 2,413,942. Gustav Bojner.

Mechanical pelleting of powdered adsorbent and catalytic materials, reducing wear of dies and punches of pelleting machine and producing pellets of low density and high thermal stability, comprises pelleting powdered material in machine in admixture with small amount of wood rosin, and heating pellets to remove rosin. No. 2,413,961. William Evans to Universal Oil Products Co.

Separating volatile from non-volatile acids taken up from solutions by anion-removal material, comprises subjecting material with adsorbed content of mixed acids to steam until substantial portion of more volatile acid has been removed and completing regeneration of material by treating with solution of alkali. No. 2,414,026. John Cox and Abraham Behrman to Infilco, Inc.

Heating and controlling temperature in continuously operating digester. No. 2,414,062. Johan Richter to Aktiebolaget Kamyr.

Method for utilizing borate tailings. No. 2,414,068. Herbert Smith to American Rock Wool Corp.

Canadian

Method of oxidizing an oxidizable fluid material by contacting molecular oxygen with said fluid in the presence of activated carbon. No. 439,403. Carbide and Carbon Chemicals, Ltd. (Erwin A. Schumacher and George W. Heise).

*Rubber

Improvement in fine grinding of rubber scrap which is free from fibrous material in cyclic manner with continuous removal of finely ground rubber from cyclic operation and recycling of oversized particles for further grinding. No. 2,412,586. Thomas Knowland to Boston Woven Hose & Rubber Co.

Forming rubber-amines comprises forming suspension of rubber in anhydrous ethylene diamine, heating the suspension in presence of hydrogenating catalyst selected from nickel, copper-chromite, platinum black and palladium black. No. 2,412,942. Frederick Bersworth.

Improvement in vulcanization of rubber containing accelerators, comprises incorporation in rubber mix of small amount of condensation product of thiocyanate salt of guanidine with aldehyde. No. 2,412,984. William Hill to Koppers Co., Inc.

Improvement in vulcanization of rubber containing accelerators, comprises incorporation in rubber compound of small amount of accelerator composition containing as activator thiocyanate salt of guanidine. No. 2,412,985. William Hill to Koppers Co., Inc.

Stabilized, partially oxidized cyclized rubber composition which contains diamino diphenyl methane as stabilizer. No. 2,413,432. Clarence Carson to Wingfoot Corp.

Extracting rubber from rubber-bearing plants of genus Cryptostegia includes steps of chopping whip growth thereof into sections, agitating sections in aqueous sodium bisulphite solution having pH of 6.5 at 200 to 210°F. No. 2,413,654. Ernest Reif and Mark Trafton, Jr., to United Fruit Co.

Vulcanizable product comprising rubbery substance selected from natural rubber, chloroprene polymers, butadiene copolymers with acrylonitrile, butadiene copolymers with styrene, and ester of polyamino polyacetic acid. No. 2,413,857. Frederick Bersworth and Morris Omansky to Frederick Bersworth.

Rubber-like copolymer, 10 parts by weight acrylonitrile, 24 to 27 parts butadiene-1,3 and 5 to 40 per cent (Based on total weight of polymerizable monomers) of conjugated hydrocarbon containing 8 to 12 carbon atoms. No. 2,414,012. Cecil Boord to Wingfoot Corp.

Cyclized rubber derivative, admixed therewith small amount of N-N'-di-o-methyl cyclohexyl piperazine, whole being suspended in toluol. No. 2,414,018. Clarence Carson to Wingfoot Corp.

Rubber hydrochloride film, contains as stabilizer amide of monocarboxylic aliphatic acid with polyalkylene polyamine. No. 2,414,065. Winfield Scott to Wingfoot Corp.

*Specialties

Lubricating composition, comprising lubricating oil and unsaturated amine-alpha-beta, unsaturated carboxylic acid addition-condensation polymer. No. 2,412,557. Charles Blair, Jr., to Petrolite Corp., Ltd.

Elastomer adapted for chewing gum base consisting of methacrylic acid ester polymer having in ester radical three or more carbon atoms and ester of abietic aid. No. 2,412,590. Boris Lougovoy.

Molding powder consisting of granules of colloided thermoplastic composition comprising cellulose acetate having combined acetic acid content between 52.0% and 56.0%, and having intrinsic viscosity in excess of 1.7, and plasticizer for cellulose acetate. No. 2,412,611. Walter Gloor to Hercules Powder Co.

Lubricant composition having corrosion inhibiting properties comprising from 1% to 10% of castor compound, selected from castor oil, castor amide and glycerol monoricinoleate, from 0.1% to 2% of sulfurized terpene, small but corrosion inhibiting amounts of soap of preferentially oil-soluble petroleum sulfonic acid, and major proportion of hydrocarbon lubricating oil. No. 2,412,633. Murray Schwartz to Standard Oil Co.

Composition of matter comprising 5% to about 40% of soap of a preferentially oil-soluble petroleum sulfonic acid, 0.5% to 10% of castor compound selected from castor oil, castor amide and glycerol monoricinoleate, and major proportion of hydrocarbon lubricating oil. No. 2,412,634. Murray Schwartz to Standard Oil Co.

Testing gasket materials for their sealing quality. No. 2,412,638. Albert Swensen.

Forming board comprises comminuting cottonseed hull bran, mixing resinous composition derived from pine wood by extraction with coal tar hydrocarbon which composition is insoluble in petroleum hydrocarbons, has methoxy content of 3 to 7%, contains oxidized abietic acid, subjecting resulting mass to heat and pressure until homogeneous board is produced. No. 2,412,652. Fritz Rosenthal to The University of Tennessee Research Corp.

Magnetic body comprising particles of magnetic material insulated from one another and bonded together by end products of heat-treated composition comprising water-soluble soap of glycerol-phthalate resin and casein. No. 2,412,668. Adolph Bandur to Western Electric Co., Inc.

Lubricant which retains lubricating qualities in presence of strong mineral acids comprises solution of 1% to 9% chlorinated natural rubber in polychloropropane liquid. No. 2,412,688. Charles Large, Maurice Zucrow and Robert Hirsch to Aerojet Engineering Corp.

Joining veneer strips to base by adhesives using tape of moisture and glue permeable paper, comprises coating permeable paper of tape with cold setting tape-adhesive which becomes sticky when moist, etc. No. 2,412,693. Gordon Pierson.

Composition to form permanent water-wettable surfaces consisting of 1 part of ethyl lactate, 1 part of methyl Cellosolve acetate, 1 to 2 parts 10% solution of cellulose acetate having acetyl content of 22-25% in 45% aqueous alcohol. No. 2,412,699. George Waugh and William Kenyon to Eastman Kodak Co.

Lubricating oil comprising lubricating oil and alpha-beta unsaturated carboxylic acid amine mixture addition-condensation polymer. No. 2,412,708. Charles Blair, Jr., to Petrolite Corp., Ltd.

Spray composition consisting of 100 gallons of water, effective concentration of finely divided water insoluble solid organic plant protectant suspended in water, small quanity of water soluble salt of metal having valence of at least two, material selected from group consisting of fatty acid, fatty acid ester, fatty acid soap, partially esterified fatty acid, partially saponified fatty acid, petroleum sulfonic acid, etc. No. 2,412,720. Clarence Dolman to Hercules Glue Co., Ltd.

Preparing chemical complex comprises heating adduct of diarylguanidine and acidic salt of metal selected from zinc, aluminum, cadmium and tin with substances selected from reaction product of formaldehyde and thiazole derivative and mixture of paraformaldehyde and thiazole derivative and mixture of paraformaldehyde and thiazole derivative. No. 2,412,801. Arnold Davis to American Cyanamid Co.

Detergent briquette, physically stable, hard, strong and non-deliquescent, consisting of dense crystalline aggregate consisting of sodium tripolyphosphate, one detergent of group consisting of sodium carbonate and trisodium phosphate. No. 2,412,819. James MacMahon to The Mathieson Alkali Works, Inc.

New article of manufacture, resistor comprising fabric having warp of strands of extruded insulating fibers and weft comprising solely single continuous piece of uncovered resistance wire interwoven with warp to form pattern wherein no portion of wire contacts any other portion thereof so that current will flow through same which follows solely series path. No. 2,412,843. Louis Spraragen to Bridgeport Fabrics, Inc.

Printing with moisture repelled, greasy printers' ink with non-hygroscopic, initially untanned gelatin surfaced, thin, water absorbent, wet

* *U. S. Patents from Vol. 593, Nos. 3, 4, 5, Vol. 594, No. 1. Canadian from Jan. 28—Feb. 18, 1947.*

strength paper printing plate having superficial printing image of hardened gelatin on and surrounded by unhardened ferrogelatin background, etc. No. 2,412,889. Edward Jahoda to Walter Fuchs.

Compounded lubricant comprising major portion of hydrocarbon lubricating oil, from 0.1 to 5% by weight based on compounded lubricant of oil-soluble alkaline earth metal phenate and from 0.1 to 5% by weight based on compounded lubricant of oil-soluble zinc thiocarbamate. No. 2,412,903. Robert Miller and John Rutherford to California Research Corp.

Producing detergent suitable for use as shampoo comprising steps of extracting naphthenic distillate having viscosity in range of 75 to 85 seconds Saybolt at 100° F. with selective solvent under conditions to form raffinate and extract, etc. No. 2,412,916. Jere Showalter to Standard Oil Development Co.

Grease-like lubricant comprising 5 to 45% castor oil and 5 to 45% petroleum oil. No. 2,412,929. Leonard Bogart and Robert Manuel to Crane Co.

Detergent composition for use in water containing electrolytes, and in hard and saline waters, consisting of alkali metal-fatty acid soap compounds and acid-tri-alkali metal salt of ethylene diamine tetracarboxylic acid. No. 2,412,943. Frederick Bersworth.

Lubricant consisting of organic liquid having dissolved therein 0.05 to 1.0 percent of alkyl-piperidine salt of a fatty acid, the alkyl group having 5 to 30 carbon atoms and the acid group having 5 to 30 carbon atoms. No. 2,412,956. George Barker to Elgin National Watch Co.

Apparatus for producing soap bar with continuous design of indented cross-section extending axially there-through. No. 2,412,979. James Garvey to Arthur Garvey and Horace Garvey and said James Garvey.

Process for rendering cellulosic textiles water repellent, includes incorporating therein monomeric compound of formula described in patent. No. 2,413,024. Ernest Zerner, Gertrude Davies and Peter Pollak to Sun Chemical Corp.

Manufacturing high temperature greases of mill grease type containing alkali metal soap of a fatty material selected from the class of non-drying fatty material, semi-drying fatty material and alkali metal rosin soap. No. 2,413,121. Reuben Swenson to Standard Oil Co.

Preparing high temperature grease containing alkali metal soap of non-drying fatty material, alkali metal rosin soap and oil and having soap content of 20%. No. 2,413,122. Reuben Swenson to Standard Oil Co.

Device for measuring liquid charge of noxious material and for discharging said charge under pressure to vaporize same in rodent burrow. No. 2,413,143. Harry Jucksch to Wheeler, Reynolds & Stauffer.

Finishing shotgun shells of wax impregnated paper, comprises suspending completed shells in enclosed space above and in hot vapors from boiling solvent for wax, removing shells after temperature has been elevated, placing in space where vapor pressure is maintained at minimum, applying lacquer coating to surface-dewaxed shells. No. 2,413,144. William King to Federal Cartridge Corp.

Wiper roll for removing excess silver-lead solder in soldering machine, resistant against ignition, consisting of fibrous cellulosic textile material and residue deposited in fibers of aqueous solution of fireproofing material of inorganic tungstate, phosphate and borophosphate salts when dried. No. 2,413,146. Ralph Larson to Continental Can Co., Inc.

Flameproofing organic fibrous material, comprising aqueous suspension of, inorganic flameproofing agent, organic flameproofing agent and joint protective and dispersing agent. No. 2,413,163. Osborne Bacon to E. I. du Pont de Nemours & Co.

Low viscosity liquid, remaining liquid at -40°C. for protracted periods without formation of crystals, consists of mixture of chlorinated ethyl benzenes and mineral oil. No. 2,413,170. Frank Clark to General Electric Co.

Lubricant maintaining metal surfaces under heat and usage, consisting of mineral lubricating oil containing salt of oxy-sulphur acid, of $R.SO_4.R'$, where R is alkyl or halogen-substituted alkyl radical, and R' is base. No. 2,413,188. John Musselman and Herman Lankelma to The Standard Oil Co.

Felt hat body stiffening composition of dispersion of zein, comprising rosin, alcohol, alkali hydroxide, water and zein, zein being five times the rosin and rosin fifteen times the alkali hydroxide by weight. No. 2,413,229. Alfred Hodshon and Harold Tucker to John Stetson Co.

Composition of matter for use as lubricant and as addition agent in amount to improve characteristics of lubricating oils and greases. No. 2,413,332. John Musselman to The Standard Oil Co.

Improved cutting oil composition comprising at least 50.0 per cent by weight of light mineral oil boiling above 350° F. and having viscosity not greater than 40 SUV at 100° F., from 1.0 to 20.0 per cent by weight of mineral oil having viscosity between 100 and about 200 SUV at 210° F., etc. No. 2,413,353. Benjamin Hunter and Harold Hobart to Gulf Oil Corp.

Metal cleaning composition, particularly adaptable for removing oxide films from aluminum and its alloys, comprising ammonium silico-fluoride and sodium acid sulfate both present in stoichiometric proportions for reaction with each other, and ammonium sulfate present in amount to inhibit formation of precipitate in water solutions of composition. No. 2,413,365. Lowell McCoy to Wyandotte Chemicals Corp.

Detergent composition comprising aqueous solution of phosphoric acid containing aqueous emulsion of diisobutyl phenyl diglycol ether sulfonate, and triamylamine, characterized by high non-corrosive property towards metals. No. 2,413,495. Charles Given to Virginia-Carolina Chemical Corp.

Adhesive and film-forming composition, comprising aqueous solution of polyvinyl alcohol containing clay identical with Chicora No. 3. No. 2,413,570. Charles Krister and Henry Sedusky and George Thompson to E. I. du Pont de Nemours & Co.

Stabilizer for fire extinguishing foam consisting of concentrated aqueous solution of proteinaceous product derived from soy bean, degraded by successive alkali and acid treatments at 200° F. and substance from class consisting of glycols and their ethers. No. 2,413,667. George Urquhart to National Foam System, Inc.

Lubricant comprising hydrocarbon oil and from .001% to 20% of oil-soluble halogen-bearing ester containing at least one carbon-boron bond. No. 2,413,718. Bert Lincoln and Gordon Byrkit to Continental Oil Co.

Bonded abrasive and method of making. No. 2,413,729. Ralph Rushmer to The Carborundum Co.

Tracing sheet comprising base of cellulosic fibers, fluid water-insoluble transparentizing composition of clear saturated petroleum oil and water-insoluble resin soluble in oil, impregnating and filling sheet base and being exposed at surfaces. No. 2,413,764. Walker Hinman to The Frederick Post Co.

Lubricant comprising hydrocarbon oil and rust-inhibiting quantity of oil-soluble reaction product of alkyl acid phosphate having 8 to 16 carbon atoms in alkyl group and branched-chain alkylamine containing 4 to 16 carbon atoms in alkyl group. No. 2,413,852. William Turner to The Atlantic Refining Co.

Metal cutting emulsion comprising watery solution of dispersing agent, comprising salt of water-soluble sulfonic tar acid, petroleum, alkaline-reacting alkali phosphate salt. No. 2,413,855. Ernst Berl; Walter Berl, executor of said Ernst Berl, deceased.

Pressure-sensitive adhesive fabric comprising backing material and pressure-sensitive adhesive coating comprising 100 parts, by weight, of resin base of polyvinyl butyral resin and not in excess of 50%, by weight of polyvinyl butyral resin, polyvinyl acetate, and 67-230 parts of active, solvent plasticizer for polyvinyl butyral resin. No. 2,413,931. Gelu Stamatoff to E. I. du Pont de Nemours & Co.

Turbine oil, comprises petroleum lubricating oil containing minor proportion, effective to retard rusting of metal parts, of compound of tris-(morpholinomethyl)-phenol and bis-(morpholinomethyl)-phenol. No. 2,413,972. Robert Herlocker, Milton Kleinholz and Franklin Watkins to Sinclair Refining Co.

Anti-fogging composition comprising surface-active ester of sulfopolycarboxylic acid with 5-25% of petroleum jelly, based on weight of ester. No. 2,414,074. Emil Vitalis to American Cyanamid Co.

Canadian

Method of making a clear, transparent, pressure-sensitive adhesive tape which is easily unwound from roll form without offsetting of adhesives. No. 439,430. Minnesota Mining & Manufacturing Co. (John William Pearson).

Adhesive tape characterized by having a coating of a stably tacky eucohesive oil-base pressure-sensitive adhesive based on dehydrated castor oil. No. 439,431. Minnesota Mining & Manufacturing Co. (Clarence Joseph Ebel and Richard Gurley Drew).

Abrasive article comprising abrasive grains and a bond containing the vulcanization product of a mixture of rubber, sulphur, and a copolymer of isobutylene and isoprene. No. 439,543. Dominion Rubber Co., Ltd. (Charles Edwin Drake).

Fire extinguisher liquid having a freezing point below -40° C. and comprising an aqueous solution of potassium carbonate and potassium lactate. No. 439,771. The Fyr-Fyter Company (John W. Wright).

Lubricating composition comprising a mineral lubricating oil and a minor amount, based on the amount of such mineral oil, of halogenated petroleum wax. No. 439,780. The Lubri-Zol Development Corporation (Continental Oil Company and Jerome Valentine).

Sheet material having on a surface thereof a dry coating comprising by weight about 25 parts of dextrine about 5 parts of bentonite and about 5 parts of glycerine. No. 439,803. Salomon Neumann and Shand Kydd, Ltd.

*Textiles

Removing dissolved gaseous products including hydrogen sulfide from viscose spinning baths, comprising forcing stream of oxidizing gas into stream of the bath liquid, forcing mixed stream through series of narrowing passages spaced along conduit and through corresponding number of widening passages, etc. No. 2,413,102. David Ebert and Abram Hogeland to American Viscose Corp.

Production of rayon. No. 2,413,123. William Underwood to E. I. du Pont de Nemours & Co.

Device for treating filamentary material with liquid. No. 2,413,413. Henry McDermott and Richard Stanley to American Viscose Corp.

Applying to fibers at stage prior to spinning fluid aqueous coating in form of thin film consisting of water and substance selected from alkali and alkylolamine salts of alkyl phosphoric acid, in which alkyl group has from 1 to 5 carbon atoms. No. 2,413,428. Howard Billings to Monsanto Chemical Co.

Method and apparatus for detecting irregularities of filaments, yarns, and the like. No. 2,413,486. Ivanhoe Denyssen to American Viscose Corp.

Preparing spinnable solution in volatile solvent of acetone-soluble vinyl resin formed by polymerization of not more than three vinyl monomers, each containing single vinyl group, normally forming with solvent solutions containing gel particles, while inhibiting formation of solid gel particles and injury to resin. No. 2,413,758. George Fremon to Carbide & Carbon Chemicals Corp.

* *Water, Sewage and Sanitation*

Waste purification apparatus having superposed aerating and clarifying chambers. No. 2,413,838. Edward Mallory.

Agricultural

Producing from oats thickening agent for aqueous compositions comprises dehulling oats, grinding groats until fineness in excess of 60 mesh, separating coarser particles from fine particles, extracting coarser particles with water-alcohol mixture, separating water-alcohol soluble fraction constituting thickening agent. No. 2,414,117. Sidney Musher to Musher Foundation, Inc.

Machine for treating starch-containing materials, comprising movable support, pressure chamber, means for supplying charge of raw material to chamber at one point in cycle of support, a closure, means for closing the closure over mouth of chamber, etc. No. 2,414,185. Edward Andrews to The Quaker Oats Co.

Obtaining increased yields in extraction of corn proteins. No. 2,414,195. Cyril Evans and Chester Ofelt to the Secretary of Agriculture of the United States of America.

Mashing comprising separately peptonizing malt at temperature of 80° to 140° F., gelatinizing grain by cooking, mixing gelatinized grain and peptonized malt at 160° F., saccharifying mixture at 145° to 155° F. No. 2,414,669. Gustave Reich.

Increasing flexibility and plasticity of green pine strips suitable for use as hoops for receptacles, comprising steaming material in presence of 5 lbs. urea for 200 lbs. green pine strips to render material flexible without destroying grain structure. No. 2,414,808. Ray Hamill to Marvil Package Co.

In manufacture of glycerin by fermentation of carbohydrates with yeast in presence of magnesium carbonate, steps comprise expelling part of more volatile products of fermentation as formed at fermentation temperature, recovering glycerin from fermentation liquor. No. 2,414,838. Arthur Schade and Eduard Farber to The Overly Bio-Chemical Research Foundation, Inc.

Malt syrup composition containing less than 80% solids and having dispersed therein a water soluble, alkali metal acetate salt containing combined but undissociated acetic acid. No. 2,415,070. Hans Bauer and Elmer Glabe to Stein, Hall & Co., Inc.

Cellulose

Process comprises heating at 85° to 140° C. methallylcellulose having at least one methallyl group per glucose unit of ether with 1% to 4% of sulfur and 2% to 5% zinc until ether is insoluble in organic solvents for untreated ether. No. 2,414,144. Maurice Ernsberger to E. I. du Pont de Nemours & Co.

Bonding plurality of cellulosic members comprising interposing between cellulosic members water-containing liquid resin adhesive and bonding

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** U. S. Patents from Vol. 593, Nos. 3, 4, 5, Vol. 594, No. 1. Canadian from Jan. 28—Feb. 18, 1947.*

medium containing formaldehyde-liberating setting agent in amount to set and harden resin adhesive, etc. No. 2,414,415. Philip Rhodes to Pennsylvania Coal Products Co.

Improving clarity of cellulose ether soluble in lower fatty acids, comprises dissolving cellulose ether in lower fatty acid, precipitating part only of cellulose ether by diluting solution with water. No. 2,414,563. John Sharphouse, Philip Hawtin, John Downing and Walter Groombridge to British Celanese Ltd.

Process for production of cellulose esters. No. 2,414,869. Clifford Haney and Mervin Martin to Celanese Corp. of America.

Aldehyde cellulose products and process of making. No. 2,415,039. John Rust to Montclair Research Corp.

Ketone-cellulose products and process of making. No. 2,415,040. John Rust to Montclair Research Corp.

Unsaturated ether-cellulose derivative and process of making. No. 2,415,041. John Rust to Montclair Research Corp.

Beta-substituted nitrile-cellulose products and process of making. No. 2,415,042. John Rust to Montclair Research Corp.

Carbodimide-cellulose products and process of making. No. 2,415,043. John Rust to Montclair Research Corp.

Unsaturated polycarboxylic acid-cellulose products and process of making. No. 2,415,044. John Rust to Montclair Research Corp.

Ceramics

Vitreous and vitrifiable compositions of matter and methods of making same. Nos. 2,414,367; 2,414,368; 2,414,369. Harold Feichter to United States Quarry Tile Co.

Retaining selenium in glass during processing from batch stage to time of fabrication of final article comprises incorporating in glass batch in conjunction with selenium material from group consisting of silicon, silicides, silicon carbide, and alloys containing silicon. No. 2,414,413. Arnold Pavlish and Chester Austin to Battelle Memorial Institute.

Glass having power factor less than .06%, dielectric constant of at least 7 and softening temperature less than 625° C. No. 2,414,504. William Armistead to Corning Glass Works.

Working up refractory magnesia-containing rock. No. 2,414,980. Robert Schoenlaub to Basic Refractories, Inc.

Coatings

Mold coating composition and method of protecting plastics during molding. No. 2,414,093. Donald Cole and James Wynn.

Coating a web surface comprising applying a liquid dispersion of spray-dried clay-resin composition and starch and calendering the coated surface. No. 2,414,313. Thomas Leek to Edgar Brothers Co.

Apparatus for applying coatings to plurality of surfaces of articles, comprising base, housing mounted on base, providing with base chamber for apparatus, rotatable supports for supporting articles in upright positions, means within housing for thermally evaporating materials to provide coatings by deposition, etc. No. 2,414,406. William Colbert and Arthur Weinrich to Libbey-Owens Ford Glass Co.

Preparing resin-like coating composition, comprising heat-reacting resorcin with oil selected from vegetable and animal oils containing 40% to 60% trilinolein and 7½% to 15% of concentrated sulphuric acid taken on weight of resorcin. No. 2,414,417. Arthur Norton to Pennsylvania Coal Products Co.

Paint composition comprising organic vehicle which upon drying forms hard, thin, impervious film, pigment, aliphatic amine and cyclic amine. No. 2,414,427. Paul Zurcher to Continental Oil Co.

Forming adherent fine grained coating of metallic selenium upon electro-conductor surface, comprises electro-depositing metallic selenium upon electro-conductor as anode of pair of electrodes in aqueous alkaline solution that comprises selenide selected from ammonium, alkali metal, and alkaline earth metal selenides. No. 2,414,438. Mortimer Bloom to Federal Telephone & Radio Corp.

Measuring relative resistance to abrasion of reflection-reducing coating on glass and plastic surfaces comprising immersing material bearing coating in suspension of substantial proportions of finely divided solid abrasive in water; setting up controlled relative motion between coating and suspension. No. 2,414,439. Thomas Brandon.

White porcelain enamel characterized by suitability for application directly to ferrous work pieces, such characteristic imparted by presence of antimony and molybdenum with barium in greater amount. No. 2,414,633. Eugene Bryant to Ferro Enamel Corp.

Ceramic paint vehicle adapted and intended for use with ceramic pigments in production of ceramic paints, vehicle comprising at room temperature viscous aqueous solution resulting from dissolving crystalline water-insoluble potassium metaphosphate in aqueous solution of water soluble inorganic salt of class consisting of ammonium salts and salts of alkali-metal other than potassium. No. 2,414,742. Henry Jackson to Hall Laboratories, Inc.

Dyes, Pigments

Anthraquinone dyestuffs. No. 2,414,155. Frank Lodge to Imperial Chemical Industries, Ltd.

In continuous process for dyeing textile fibers with vat dyes, steps which comprise padding fiber, which has been impregnated with unreduced dye in pigment form, with caustic alkali solution of reducing agent under conditions which do not immediately reduce vat color on fiber, etc. No. 2,415,379. Nicholas Viera to E. I. du Pont de Nemours & Co.

Preparing zinc yellow pigments, comprises reacting aqueous suspension of zinc oxide and solution of alkali metal tetrachromate, with no excess of either reactant, separating precipitated pigment from aqueous medium. No. 2,415,394. Omar Tarr and Marc Darrin to Mutual Chemical Co. of America.

Canadian

An iron blue pigment of improved alkali resistance, comprising ferric ferro-cyanide particles having deposited thereon 1.0 to 1.5 per cent of nickel in the form of a basic water-insoluble compound. No. 439,893 Interchemical Corp. (Edwin A. Wilson, and Irving Shack).

Dyestuff developed with copper compounds. No. 440,253. Ciba Ltd. (Otto Kaiser)

Equipment

Apparatus for cooling gaseous medium comprising dry cooling stage in

first chamber, wet cooling stage in second chamber, first chamber having inlet for admission of raw gaseous medium to be cooled, second chamber having opening capable of discharging portion of cooled, gaseous medium into place of utilization, etc. No. 2,414,135. Max Berlowitz; Elly Berlowitz, administratrix of said Max Berlowitz, deceased.

Apparatus for dispensing a predetermined accurately measured quantity of pressure fluid comprising in a casing a main chamber, a fluid inlet chamber, a main piston reciprocable in main chamber, piston sleeve connected with main piston reciprocable in inlet chamber, feed inlet for pressure fluid into interior of piston sleeve, a main fluid dispensing orifice, etc. No. 2,414,354. Lars Blomberg to Aktiebolaget Latex.

Generating radient energy for spectrum analysis. No. 2,414,363. Harry Dietert and Carl King to Maurice Hasler and Towland Lindhurst, copartners, doing business as Applied Research Laboratories.

Gas and vapor determinator for molding material, comprising container in which material is placed, closure for container having outlet port, conduit in communication with outlet port, gas measuring means connected to conduit, means for heating portion of container having material to be tested, and means for cooling closure and portion of container adjacent to predetermined constant temperature. No. 2,414,364. Harry Dietert and Robert Doelman; said Doelman to said Dietert.

Mechanism for applying adhesive substance to upper surface of advancing sheet material. No. 2,414,728. Harold Faris and John White to National Automotive Fibres, Inc.

Device for densifying dry powderly materials, comprising first and second rollers having parallel axes and mounted in horizontal plane, first belt of foraminous textile material to travel about rollers, third and fourth rollers having parallel axes and mounted in plane converging with horizontal plane, etc. No. 2,415,355. Charles Kaufmann and Arthur Andersen to Shawinigan Chemicals, Ltd.

Canadian

Apparatus for the recovery of chemicals in a dry condition and heat from waste sulphite liquor. No. 439,843. George H. Tomlinson.

Explosives

Modified black powder composition containing between 5% and 25% of carbon black prepared by incomplete combustion of carbonaceous gaseous fuel. No. 2,414,465. Harrison Holmes and Walter Lawson to E. I. du Pont de Nemours & Co.

Diisopropanolamine trinitrate. No. 2,415,001. John Brandner to Atlas Powder Co.

Food

Refining honey comprises heating honey at concentration below 50° Brix containing undissolved solid impurities to elevated temperature until solid impurities separate out and collect together, separating solids and liquid phases. No. 2,414,290. Arvid Erickson and John Ryan to Barron-Gray Packing Co.

Protein hydrolysate flavoring material. No. 2,414,299. Lloyd Hall to The Griffith Laboratories, Inc.

Canadian

Process of hydrolyzing protein for the production of glutamic acid. No. 439,885 General Mills, Inc. (Vern S. Waters)

A method of dehydrating natural, fat-containing cheese. No. 439,982. George Patrick Sanders.

Inorganic

Making alkali metal higher oxides, comprises vaporizing alkali metal, carrying vapor away from unvaporized metal by means of inert gas, bringing vapor into contact with oxygen, alkali metal oxide thus formed. No. 2,414,116. Roman Miller.

Producing pure tellurium from impure tellurium containing impurities of lower and higher boiling point than tellurium, comprising causing impure starting material to travel through indirectly heated furnace wherein material is subjected to successive vaporizations. No. 2,414,294. Daniel Gardner.

Producing pure selenium from impure selenium containing impurities of lower and higher boiling point than selenium, comprising causing impure selenium-containing starting material to travel through indirectly heated furnace wherein material is subjected to successive vaporizations. No. 2,414,295. Daniel Gardner.

Manufacture of laminated products from plies of porous material, process comprises impregnating faces of plies to be joined with small amount of aluminum chloride, applying silicate adhesive and combining plies whereby an insoluble bond is produced. No. 2,414,360. John Carter to Philadelphia Quartz Co.

Removing undesirable metallic elements, including iron, from aqueous solution of alkali metal tungstate. No. 2,414,601. William Lilliendahl to Westinghouse Electric Corp.

Production of strong, weathering resistant particles of lime impregnated with carbon comprises suspending particles of lime in stream of predominantly methane containing natural gas undergoing pyrolysis in indirectly heated reaction zone maintained at 1000° to 1300° C., etc. No. 2,414,625. Armand Abrams, Charles Baker, Carl Kuhn, Jr. and Lorld Sharp to Socony-Vacuum Oil Co., Inc.

Manufacturing granular superphosphate comprising adding 10% by weight of dry finely divided material to fresh superphosphate, adding aqueous medium to bring mixture to desired consistency for agglomeration, agglomerating mixture, drying agglomerated particles. No. 2,414,700. Mark Shoeld to The Davison Chemical Corp.

Manufacturing granular superphosphate comprising adding classifier dust to fresh superphosphate, adding aqueous medium to bring mixture to moisture content of fresh superphosphate, agglomerating mixture, drying agglomerated particles. No. 2,414,701. Mark Shoeld to The Davison Chemical Corp.

Regenerating sulfuric acid spent in alkylation of hydrocarbons. No. 2,414,727. Harold Ellender to Standard Oil Development Co.

In electrolytic alkali-chlorine cell adapted to contain electrolyte and provided with electrodes adapted to be immersed therein, means for passing electric current through electrolyte in cell between electrodes therein, etc. No. 2,414,741. Deane Hubbard to Hooker Electrochemical Co.

Removing impurities in form of oxygen introduced into fused halide salt bath of electrolytic cell during operation comprises introducing into bath metallic scavenger for combination with oxygen to form bath-soluble oxygen compound, circulating bath into zone of electrolytic action within cell provided by purifying auxiliary electrodes, etc. No. 2,414,831. Robert McNitt.

Removing sulfur dioxide from anhydrous hydrofluoric acid contaminated therewith, comprises treating acid with hydrogen sulfide in amount at least stoichiometrically equal to sulfur dioxide in acid, thereby effecting reduction of sulfur dioxide to sulfur. No. 2,414,884. Maryan Matuszak to Phillips Petroleum Co.

Producing readily soluble agglomerates resistant to shattering during handling comprises intimately mixing finely divided molecularly dehydrate sodium phosphate with finely divided efflorescent hydrated salt selected from hydrates of sodium carbonate, sodium sulfate, sodium orthophosphate and sodium pyrophosphate, etc. No. 2,414,969. Joe Moose to Monsanto Chemical Co.

Making ferric orthophosphate comprises dissolving dibasic alkali metal phosphate and alkali metal salt of carbonic acid in water to form solution, adding aqueous solution of ferric salt. No. 2,414,974. Morris Nielsen to Monsanto Chemical Co.

Removing sulfur dioxide from hydrofluoric acid containing same, comprises admixing hydrofluoric acid with material selected from heavy olefinic oil formed in alkylation of paraffins with olefins with hydrofluoric acid, and spent hydrofluoric acid containing olefinic contaminants, etc. No. 2,415,003. Ralph Cole to Phillips Petroleum Co.

Making carbon black having fast filter rate and high decolorizing properties. No. 2,415,072. Owen Brown, Jr. to Godfrey L. Cabot, Inc.

Production of magnesium hydroxide crystal aggregates exceeding for major part 30 microns diameter, comprises introducing aqueous solution of magnesium salt and aqueous hydroxide into vigorously agitated suspension of magnesium hydroxide crystals in reaction zone, etc. No. 2,415,074. Leslie Clark and John Robinson to Imperial Chemical Industries, Ltd.

Fluorescent silicate of group II metal of atomic weight below 200 activated with titanium alone in amount equivalent to approximately ½ to 1 per cent TiO_2 by weight, emitting ultraviolet when subjected to cathode rays. No. 2,415,129. Herman Froelich to General Electric Co.

In mercury cathode electrolytic cell comprising brine chamber and regenerator chamber at different levels, combination including means for conducting mercury between chambers including mercury seal structure in which is disposed pool of mercury, ceiling above mercury in seal, etc. No. 2,415,135. Roy Horst and Eugene Port to The Solvay Process Co.

In heat recuperative process for making chlorine from common salt comprises converting chlorine in salt into gaseous hydrochloric acid by interaction with SO_2, steam and air at red heat, etc. No. 2,415,152. Alfred Thomsen.

Apparatus for stripping sulfur trioxide from oleum. No. 2,415,159. John Bradley and Albert Regenbrecht to E. I. du Pont de Nemours & Co.

Preparation of sodium chlorosulfonate comprising conveying finely ground sodium chloride continuously against countercurrent of contact sulfuric acid converter gas, contacting unreacted sodium chloride until sodium chlorosulfonate is obtained. No. 2,415,358. Napoleon Laury to American Cyanamid Co.

Canadian

Calcium nitrate and carbon dioxide simultaneous manufacturing process. No. 440,064 Montecatini Societa Generale per L'Industria Mineraria ed Agricola (Gerlando Marullo)

Process for the manufacture of concentrated ammonium nitrate solution from nitric acid and ammonia and apparatus therefor. No. 440,065. Montecatini, Societa Generale per L'Industria Mineraria e Chimica (Giacomo Fauser)

Purifying anhydrous stannic halide which contains a metallic impurity by precipitating impurities by means of a reactive sulphide. No. 440,138. Pittsburgh Plate Glass Company (Alphonse Peckukas)

Producing a luminescent composition by igniting zinc oxide and sulphur in stoichiometric proportions in a non-oxidizing atmosphere and at a temperature between 1100° C. and 1350° C. No. 440,203 Mac Goodman.

Production of chlorine by subjecting a dry magnesium chloride-magnesia mixture in the form of a fine powder to reaction with oxygen. No. 440,307. Claude George Bonard.

Medicinal

Producing quinacrine suitable for medicinal use, comprises: reacting 2-methoxy-6,9-dichloracridine with 1-diethylamino-4-aminopentane in presence of phenol, etc. No. 2,414,561. James Rundell and Taisto Aho to Abbott Laboratories.

Production of pantothenic acid and other related growth promoting substances. No. 2,414,682. Roger Williams to Research Corp.

Manufacture of vitamin A, comprises condensing ionone member of group consisting of 4-hydroxy-2-methyl-2-butenal and ethers and esters of said hydroxy butenal with succinic acid, succinic anhydride or succinates. No. 2,414,722. Bishop Cornwell.

Preparation of sulphonamide compounds which contain amidine group, comprises converting benzamidine p-sulphonic acid into acid chloride and reacting acid chloride obtained with aminopyridine. No. 2,414,892. Peter Oxley and Wallace Short to Boots Pure Drug Co., Ltd.

Therapeutic composition for nebulization therapy of asthma comprises aqueous solution of epinephrine salt, in which solution is dissolved polyhydric alcohol to lower vapor pressure to stabilize mist formed on nebulization of therapeutic composition. No. 2,414,918. Harold Abramson.

Non-infectious antigen of lymphogranuloma-venereum-psittacosis group of agents comprising infectious antigen of agent which has been treated with protein-denaturing substance of aliphatic carbamyl-compound type. No. 2,415,234. William Bunney and Clara Nigg to E. R. Squibb & Sons.

Heat sterilized therapeutic composition free of precipitation, stabilized as to pharmaceutical potency and capable of parenteral administration comprising extract of digitalis in solvent consisting of mixture of water and propanediol. No. 2,415,312. Marvin Thompson, Nicholas Accousti and Casimir Ichniowski to William R. Warner & Co., Inc.

Metals, Ores

Producing corrosion resistant coatings on magnesium and magnesium base alloys comprising, subjecting metals to anodic action in electrolytic bath consisting of aqueous solution containing water soluble salt of chromic acid, water soluble phosphate and magnesium fluoride, solution being within range of pH3 and pH6.5. No. 2,414,090. Robert Buzzard.

Concentration by froth flotation of non-sulfide ores, subjecting material when finely ground to flotation in presence of emulsion of mineral oil and fatty acid stabilized by wetting agent as collector and by addition of usual modifiers, step of adding first to pulp non-collecting organic compound containing one amino nitrogen in alpha or beta (1 or 2) position to one carboxyl group. No. 2,414,199. Gregoire Gutzeit.

In method of making ingots in open mold shells by continuous casting process, comprises chilling mold shell with water spray under pressure of 0.5 to 4 pounds per square inch, in form of multiplicity of jets, from large body of water maintained adjacent the mold. No. 2,414,269. Edwin Nicholls to Aluminum Co. of America.

Additional patents from the above volumes will be given next month.

Trademarks of the Month

A Checklist of Chemical and Chemical Specialties Trademarks

427,188. Copy Papers, Inc., Chicago, Ill.; filed Sept. 1, 1945; Serial No. 487,892; for soap cream for removing ink stains from hands; since Jan. 1, 1932.

427,191. Floz-On Mfg. Co., Pittsburgh, Pa.; filed Oct. 16, 1945; Serial No. 490,019; for floor wax; since June 19, 1945.

427,195. Kumar Kompany, Thomasville, Ga.; filed Nov. 3, 1945; Serial No. 491,019; for cleaning compound having properties as germicidal deodorant and disinfectant; since Aug. 17, 1937.

427,196. I. A. Kreiner, as Absorb-Ol Products Co., Casper, Wyo.; filed Nov. 19, 1945; Serial No. 491,844; for floor cleaning compound; since June 30, 1945.

427,201. The Rayon Processing Co. of R. I. Inc., Central Falls, R. I.; filed Dec. 4, 1945; Serial No. 492,656; for chopped cotton cord as filler for formaldehyde plastics molding compounds; since September 1943.

427,213. Malcolm R. White, Chester, N. Y.; filed Mar. 18, 1946; Serial No. 498,474; for plastic cordage; since Sept. 21, 1943.

427,216. Magnus G. Riebeling, as Bestovall Cleaning Products Co., Portland, Oregon.; filed Mar. 28, 1946, Serial No. 499,152; for cleansing preparation for removing rust stains; since August 1933.

427,222. Haskelite Manufacturing Corp., Grand Rapids, Mich.; filed May 16, 1946; Serial No. 502,213; for laminated material of layers of resin-impregnated fabric, paper; since June 13, 1944.

475,358. Central Soya Co., Inc., Fort Wayne, Ind.; filed Oct. 16, 1944; for soy bean powder preparation for use in manufacture of paper, linoleum, oil cloth, paint; since Mar. 15, 1944.

485,668. Sylvania Industrial Corp., Fredericksburg, Va., and New York, N. Y., to American Viscose Corp., Wilmington, Del.; filed July 10, 1945; for tubing of nonfibrous cellulosic material; since May 10, 1945.

489,968. Industrial Management Corp., Los Angeles, Calif.; filed Oct. 15, 1945; for insecticide; since Aug. 23, 1945.

490,363. Dunlop Tire & Rubber Corp., Buffalo, N. Y.; filed Oct. 23, 1945; for cellular rubber; since Sept. 27, 1945.

490,791. Chemical Associates of America, Inc., New York, N. Y.; filed Oct. 31, 1945; for insecticide; since Sept. 20, 1945.

491,546. A. D. Chapman & Co., Inc., Chicago, Ill.; filed Nov. 14, 1945; for chemicals for rendering wood water repellent; since Aug. 1, 1945.

492,770. Paul W. Garbo, Long Beach, N. Y.; filed Dec. 6, 1945; for powdered detergent compositions; since September 1945.

493,190. Hercules Powder Co., Wilmington, Del.; filed Dec. 13, 1945; for synthetic resin; since Sept. 20, 1945.

495,849. Witco Chemical Co., Chicago, Ill.; filed Feb. 1, 1946; for carbon black dispersed or suspended in water; since July 1943.

496,053. United States Rubber Co., New York, N. Y.; filed Feb. 5, 1946; for thermosetting synthetic resins; since Jan. 3, 1946.

496,175. Tudor Chemical Specialties, Inc., New York, N. Y.; filed Feb. 7, 1946; for hand cleaning composition; since Oct. 2, 1945.

496,405. William A. Sampsel, as Acrylic Plastic Laboratory, Los Angeles, Calif.; filed Feb. 11, 1946; for transparent mountings for mineral, biological, and pathological subjects; since Dec. 19, 1945.

496,665. Romar Chemical Co., Philadelphia, Pa.; filed Feb. 15, 1946; for cleaning white metal; since Nov. 1, 1944.

497,352. Tri-Tix, Inc., Milwaukee, Wis.; filed Feb. 27, 1946; for adhesive compound for bookbinding; since July 1, 1937.

497,370. Commanditaire Vennootschap Chemische Fabriek Rids, Ijmuiden, Netherlands; filed Feb. 28, 1946; for chemical preparations for deodorizing air, human and animal bodies; since Oct. 29, 1945.

497,478. Hercules Powder Co., Wilmington, Del.; filed Mar. 1, 1946; for synthetic resin; since Feb. 14, 1946.

497,479. Hercules Powder Co., Wilmington, Del.; filed Mar. 1, 1946; for synthetic resin; since Feb. 14, 1946.

498,283. Herbert J. Heribert, New York, N. Y.; filed Mar. 15, 1946; for adhesive for bonding cork, leather, linoleum; since Mar. 1, 1946.

498,578. Binney & Smith Co., New York, N. Y.; filed Mar. 20, 1946; for product composed of carbon black, artificial resin and plasticizer; since Apr. 20, 1936.

498,764. Grand Rapids Paint & Enamel Co., Grand Rapids, Mich.; filed Mar. 22, 1946; for plastic varnish; since Mar. 2, 1946.

498,906. Kent Chemical Co., Grand Rapids, Mich.; filed Mar. 25, 1946; for soap products; since Feb. 1, 1946.

499,090. United Chromium, Inc., New York, N. Y., Waterbury, Conn., Detroit, Mich., Los Angeles, Calif., and Carteret, N. J.; filed Mar. 27, 1946; for cements for sealing joints of containers of chemical solutions; since Mar. 24, 1943.

499,264. F. G. Okie, Inc., Philadelphia, Pa.; filed Mar. 29, 1946; for printing inks; since May 1, 1941.

499,271. Frank W. Paul, as P & H Products, Memphis, Tenn.; filed Mar. 29, 1946; for solvent for removing wax and grease prior to painting; since Mar. 12, 1946.

499,884. American Chemical Paint Co., Ambler, Pa.; filed Apr. 9, 1946; for compound for preparing metal surfaces for paint; since Mar. 29, 1946.

500,140. Socony-Vacuum Oil Co., Inc., New York, N. Y.; filed Apr. 12, 1946; for oil compositions for dressing leather goods; compositions for cleaning textiles; since Jan. 31, 1936.

500,345. Academy Award Products, Inc., New York, N. Y.; filed Apr. 17, 1946; for pasty inks; since Feb. 6, 1946.

500,432. The Visking Corp., Chicago, Ill.; filed Apr. 17, 1946; for flexible thin-walled plastic tubing; since Feb. 12, 1945.

500,637. United States Rubber Co., New York, N. Y.; filed Apr. 20, 1946; for weed killer; since Dec. 13, 1945.

500,919. Windsor Wax Co., Inc., Hoboken, N. J.; filed Apr. 25, 1946; for floor cleaner; since Sept. 5, 1942.

501,344. Selectronic Dispersions, Inc., Montclair, N. J.; filed May 2, 1946; for plastic compounds; since Apr. 1, 1946.

501,563. Burt Manufacturing Co., Meriden, Conn.; filed May 7, 1946; for adhesive cement for polishing wheels; since Jan. 25, 1946.

502,536. Selectronic Dispersions, Inc., Montclair, N. J.; filed May 21, 1946; for plastic compounds; since Apr. 11, 1945.

502,899. Jefferson Lake Sulphur Co., Inc., Houston, Tex.; filed May 28, 1946; for carbon black; since Mar. 1, 1946.

504,086. The Arefact Corp., Rock Hill, S. C.; filed June 18, 1946; for water proofing composition; since May 27, 1946.

511,771. Tykor Products, Inc., New York, N. Y.; filed Oct. 30, 1946; for insecticides; since Apr. 17, 1946.

512,247. Eronel Industries, Los Angeles, Calif.; filed Nov. 8, 1946; for flameproofing of textiles; since June 29, 1944.

Trademarks reproduced and described include those appearing in Official Gazette of U. S. Patent Office. January 14—February 4.

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427,195

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427,196

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427,201

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427,213

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427,216

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427,222

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475,358

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485,668

INSECT-O-BLITZ
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By perfecting new methods of stabilizing Sulfur Trioxide, General Chemical Research takes an invaluable chemical tool off the shelf of laboratory curiosities and brings it to the Process Industries as a chemical of commerce for use in a host of ways.

General Chemical offers SULFAN in three chemically equivalent forms:

Sulfan 'A' Partially Stabilized, melting at approx. 35°C;

Sulfan 'B' Completely Stabilized, melting at approx. 17°C; and

Sulfan 'C' Unstabilized.

Experimental samples and further technical information are available on request from General Chemical Company, Research and Development Division, 40 Rector Street, New York 6, N. Y.

Some Potential Uses

1. For fortification of spent oleum, making possible a ready supply of any strength oleum.
2. In benzenoid sulfonations for elimination of mixed sulfonates: meta- only or ortho- and para- derivatives only are formed.
3. For di- and poly-sulfonations of aryl compounds.
4. For direct sulfonation of aliphatics.
5. For sulfonations in the presence of a solvent, thus eliminating the removal of H_2SO_4 necessary when oleum is the agent.
6. For formation of addition compounds with amines, valuable in organic synthesis.

Sulfuric Anhydride exists in three chemically equivalent physical modifications as indicated by data below. General Chemical's stabilized product is almost entirely Gamma-Form and its partially stabilized product is largely Beta-Form.

PROPERTY	GAMMA-FORM	BETA-FORM	ALPHA-FORM
Description	Ice-Like	Asbestos-Like	Asbestos-Like
Equilibrium Melting Point (°C):	16.8	32.5	62.3
Density (20°C)	1.9255	—	—
Sp. Ht. (cals/gm) (20°C)	0.77	—	—
Ht. of Fusion (cals/mol)	1,800	2,900	6,200
Ht. of Sublimation (cals/mol)	11,900	13,000	16,300
Ht. of Dilution (cals/mol)	40,340	—	—
Vapor Pressure (mm.)			
0°C	45	32	5.8
25	433	344	73
50	950	950	650
75	3,000	3,000	3,000

GENERAL CHEMICAL COMPANY

40 RECTOR STREET, NEW YORK 6, N. Y.

Sales and Technical Service Offices in principal cities from coast to coast

*Mark, General Chemical Company